134-24.

ELEVATORS

CATALOG No. 36A

1926

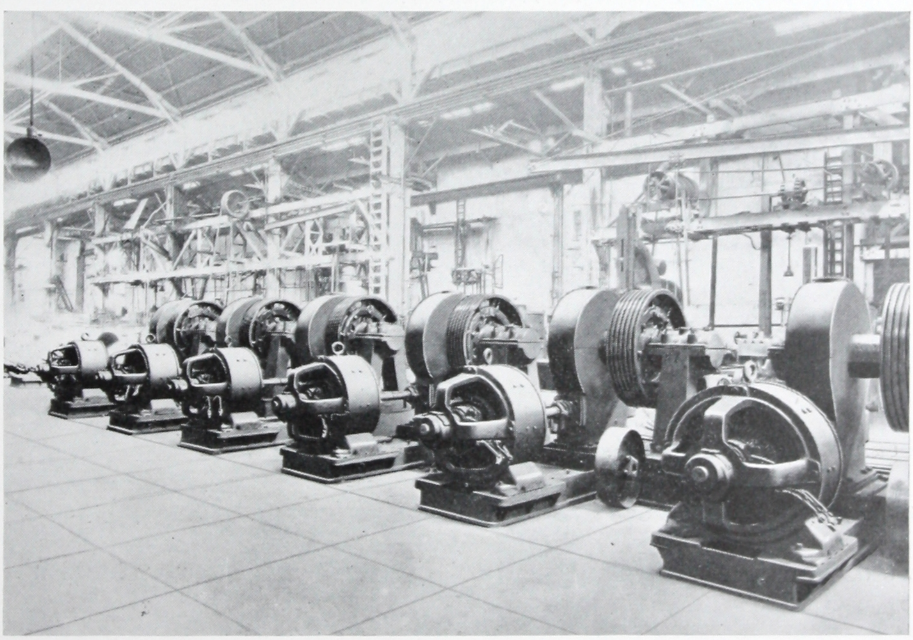
LLEWELLYN IRON WORKS

LOS ANGELES, CAL.

ELEVATOR DEPARTMENT

CATALOG No. 36A
1926

ELEVATORS



LLEWELLYN IRON WORKS

LOS ANGELES, CAL.

OUR PRODUCTS

We build Passenger and Freight Elevators of all kinds and sizes.

We design, fabricate and erect structural steel buildings for any purpose.

Our other products include:

Contractor's Hoists and Equipment.
Mining and Crushing Machinery.
Hoists—Steam, Electric, Gas or Oil Engine Driven.
Crushing Rolls, Ball Mills, Stamp Mills, Mine Cars.
Cages, Skips, Ore Buckets, Conveying Machinery.
Plate Steel Work, Tanks, Pipe, etc.
Boilers—Water Tube, Return Tubular, Locomotive Type.
Semi-steel and gray Iron Castings of any size.
Steel Forgings of any size.
Travelling Cranes.

We carry the largest stock of structural steel in the West.

Our shops are self-contained and among the largest and best equipped anywhere.

If we do not have what you want in the machinery line we can build it.

INTRODUCTION

For over twenty-five years, the Llewellyn Iron Works has been engaged in the manufacture and installation of elevators for freight and passenger service. Our line of designs is very complete and modern. It covers hydraulic and hydro-electric elevators of all standard types, single and double worm geared electric machines arranged for either winding drum or traction drive and gearless traction elevators of the most modern designs.

The construction of all of our Elevator Machines is heavy and rigid, resulting in a machine that is free from vibration and one that will render long service at a minimum cost for upkeep. Only the highest grade of material and workmanship are utilized in their construction. All machines are carefully tested before leaving the shops, and the whole elevator is given a set of thorough tests after the installation is completed.

We contract for the complete equipment to be installed by the purchaser, or for the complete elevator installed in the building and hoistway provided by the purchaser. Under ordinary conditions, we prefer to make the installation, as we feel that in so doing our equipment will be properly handled and the installation and starting correctly done.

It has always been our aim to give the best possible service to our customers, and our idea in issuing this bulletin is to begin our service with the prospective customer. In this bulletin we have attempted to give a brief outline, with illustrations wherever possible, of the various types and classes of elevators and elevator auxiliaries in general. It is hoped that the prospective purchaser, engineer or architect will find the following pages of assistance to him in the selection of elevator equipments to properly meet his requirements.

Our Engineering Staff is always at the disposal of those who are interested in elevator problems and who need assistance in their solutions.

REPAIR SERVICE

We have in our regular employ, within call, night or day, expert service men who are always available to take care of trouble on any of our elevator installations.

We also have an organized inspection crew for making periodical inspections of elevators. They report to the owner the required repairs and upon his instructions make such repairs as are necessary to place the machines in first-class working condition.

THE ELECTRIC ELEVATOR

Practically all modern electric elevators are made up of about the same principal parts, which are as follows:

(a) The car, consisting of the steel frame with the guide gripping safety device attached to the bottom cross members. The cage is built separately and mounted in the steel frame, or sling.

(b) The counter-weight for balancing the car plus additional weight to partly counterbalance the live load.

(c) The hoistway, with its rails for guiding the car and counter-weight in their vertical travel.

(d) The hoisting engine, or elevator machine with motor and brake.

(e) The electric controller for automatically governing the direction, acceleration and speed of the car.

(f) The master controller, or car switch, which is mounted in the car.

(g) In case of Variable Voltage Control there will be a motor generator set for generating the variable voltage required for the operation and control of the elevator car.

LOCATION OF HOISTING MACHINE

In many of the older installations the hoisting machine was located in the basement of the building, but the present practice is to locate it on top of the building directly over the hoistway. Basement installations require more space, the length of cables required is about twice that required for overhead machines; the number of idler sheaves is increased, with a consequent increase in cable bends and cable wear, and the load on the building is usually greater than for an overhead machine. Placing the machine directly over the hoistway imposes a load on the building equal to the weight of the hoisting machine plus the load on the car and counter-weight ropes. Whereas placing the machine in the basement imposes a load on the building equal to twice the load carried by the car and counter-weight ropes. Therefore, if the hoisting engine weighs less than the combined loads on the car and counter-weight ropes, placing the machine overhead reduces the load on the building. This relation of weights usually exists on all installations, except the one-to-one gearless traction elevators, where the load on the building with the machine mounted overhead is approximately the same as with it located in the basement.

ROPING

Elevator machines may be divided, according to the method of roping employed, into two main clases: Winding Drum and Traction. All of the earliest elevators were of the winding drum type, but on account of the greater safety, compactness, simplicity of construction and application, the traction type is gradually superseding the drum type of elevator for all classes of service. Plates following show typical methods of roping both winding drum and traction machines.

In the accompanying illustrations the large wheels represent the hoisting drum or sheave on the hoisting machine, the small wheels represent idler, deflecting or guide sheaves.

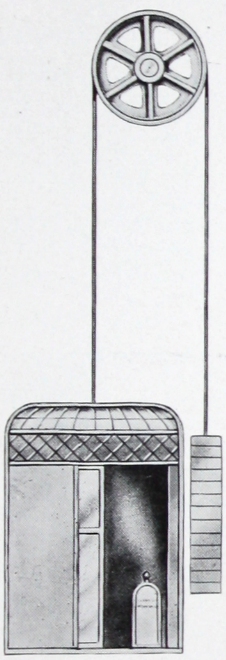


Plate 1294A

Drum Machines: The Winding Drum type of elevator, as its name implies, consists of a spirally grooved drum upon which the hoisting cables are wound, and which is usually driven through a worm gearing by a standard speed electric motor. Plate 1294A illustrates the simplest form of winding drum type of elevator with the machine located overhead. Two sets of cables are used for this elevator; one set, the car cables, has one end attached to the car and the other end attached to the drum. The other set has one end attached to the counter-weight and the other end attached to the drum. The winding drum is machined with spiral grooves and the roping is such that, as the car cables unwind, the counter-weight cables wind up and into the grooves which were occupied by the unwinding car cables. This counter-weight is commonly known as the Drum Counter-Weight. A typical Llewellyn installation of this type of machine is shown at the bottom of page 16, which is a view in the pent house of a combination car switch and push button controlled passenger elevator of the winding drum type.

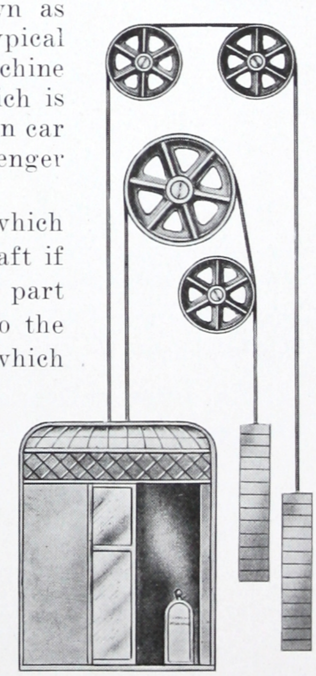


Plate 1293B

For cars which are very heavy and which would strain the drum and the drum shaft if they were made to carry all of the load, part of counter-weight is attached directly to the car and its cables run over idler sheaves which carry the load. This weight is commonly known as the Car Counter-Weight. This method of roping is illustrated by Plate 1293B. A typical Llewellyn installation of this type is shown by Plate 1191, Page 16, which is one of six machines of this type installed in the same building. The two central double grooved sheaves shown on this plate support the car counter-weight, and those at either side carry the drum counter-weight cables.

Both of the above illustrations show these methods of roping when the elevator machine is located overhead.

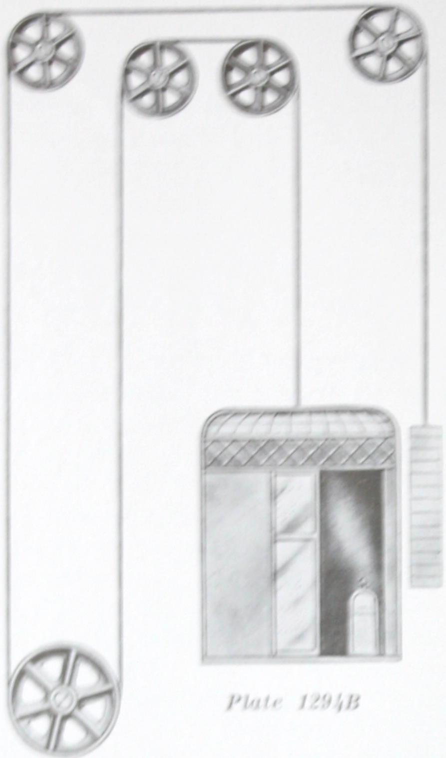


Plate 1294B

Plate 1294B illustrates the roping for a Drum Type Hoisting Machine using the same system as Plate 1294A but having the hoisting machine located in the basement.

A drum counter-weight only is used, and the arrangement is standard for light and medium capacity elevators.

Plate 1295A illustrates the roping for a Drum Type Hoisting Machine using the same system as Plate 1293B but having the hoisting machine located in the basement.

Both drum and car counter-weights are used, making an arrangement which is suitable for heavy capacity freight elevators.

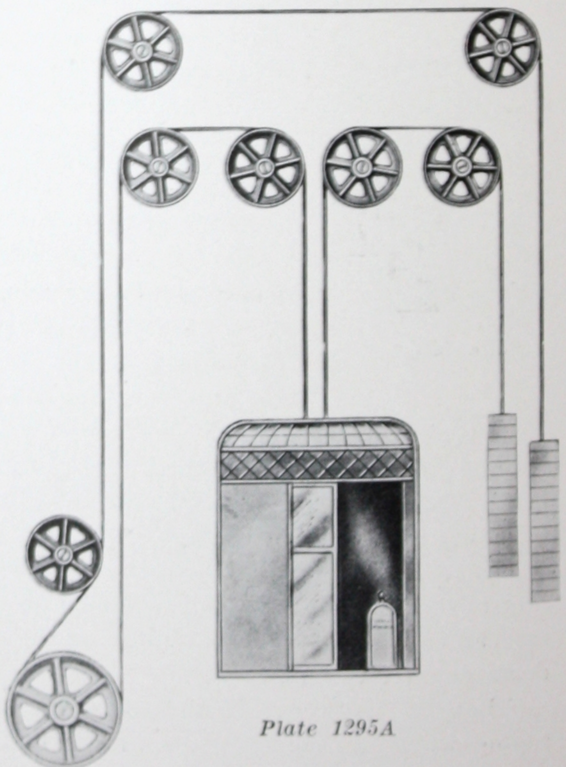


Plate 1295A

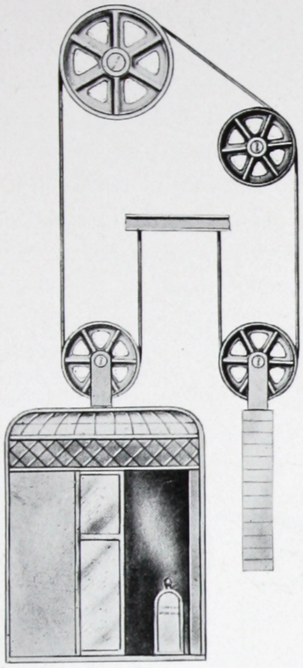


Plate 1295B

In order to use a small drum type hoisting machine for heavy capacity elevators the method of roping shown in Plate 1295B is employed. It constitutes a two to one reduction between the machine and the elevator car, which doubles the load carrying capacity of a given machine. This arrangement is known as Two to One Roping.

The plate shows an overhead winding machine employing a drum counter-weight only.

Plate 1295C shows how the capacity of an overhead drum type elevator machine can be further increased by the addition of a car counter-weight to relieve it of part of the load.

The amount of counter-weight which can be attached to the car itself is always less than the weight of the empty car, otherwise the car would not descend without load. The weight of this counter-weight is usually limited to 75% of the weight of the empty car.

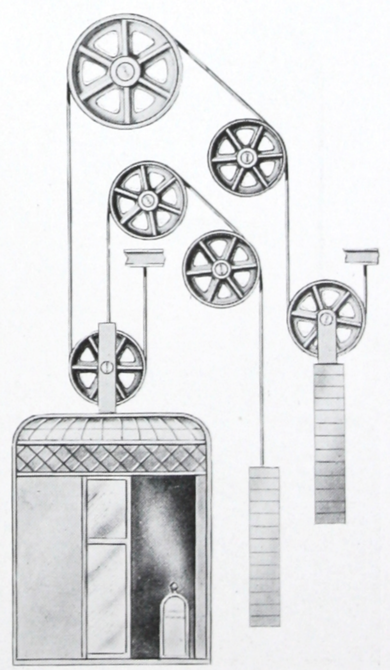


Plate 1295C

Traction Machine: The Traction Elevator derives its name from the fact that the load is driven by means of the traction existing between the hoisting cables and the power driven sheave over which they pass. The most common form of traction drive is the one wherein the cables pass from the car over the driving sheave, which is machined with parallel round bottom grooves to fit the cables, continuing around an idler sheave, thence again around the driving sheave and from there to the counter-weight, thus making two half turns, equal to one complete wrap, around the driving sheave. This form of roping is usually known as the Double Wrap Traction. Plates 1292A, 1292C and 1294C illustrate this method of drive.

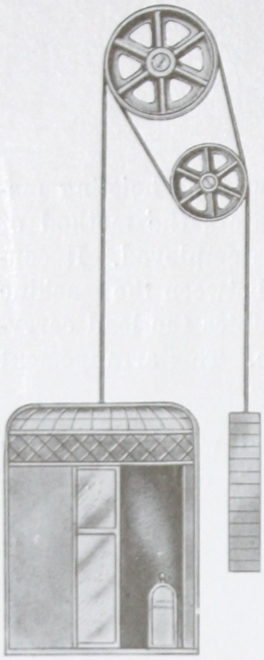


Plate 1292A

The other type of traction drive employs a driving sheave carrying V shaped parallel grooves. On account of the additional traction obtained by the pinching action of the V grooves, one-half turn of the cables around this sheave is all that is necessary to drive the car with a large factor of safety. This form of roping is usually known as Single Wrap, or V groove drive. Plates 1293A and 1293C illustrate this form of drive.

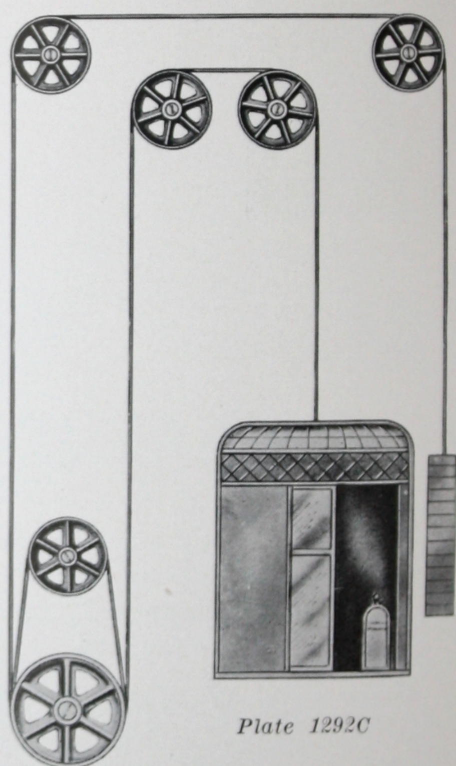


Plate 1292C

For moderate and slow speed elevators, the traction sheave is usually driven through worm gearing, while for high speed service it is, with few exceptions, mounted directly upon the shaft of a slow speed motor. This direct drive arrangement is known as the Gearless Traction Elevator, which at the present stage of the art, is the highest grade elevator made.

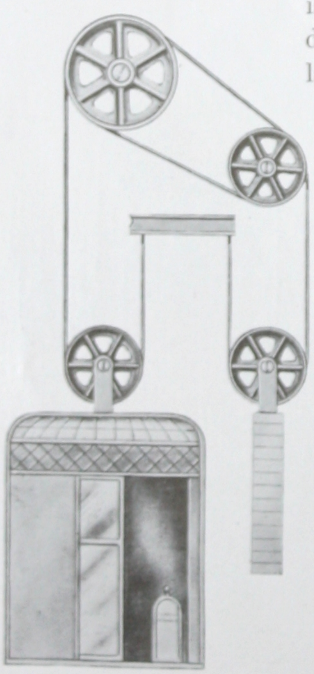


Plate 1294C

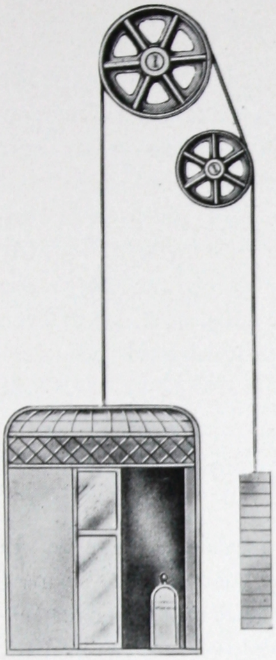


Plate 1293A

Plate 1293A illustrates the Roping of a Single Wrap Traction Type V Groove Drive with the hoisting machine located overhead. This is the simplest possible method of roping an elevator.

Plate 1293C illustrates the Roping of a Single Wrap Traction Type V Groove Drive with the hoisting machine located in the basement.

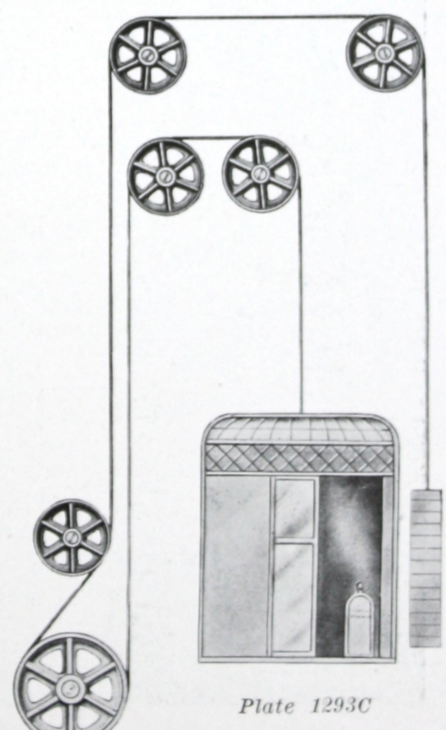


Plate 1293C

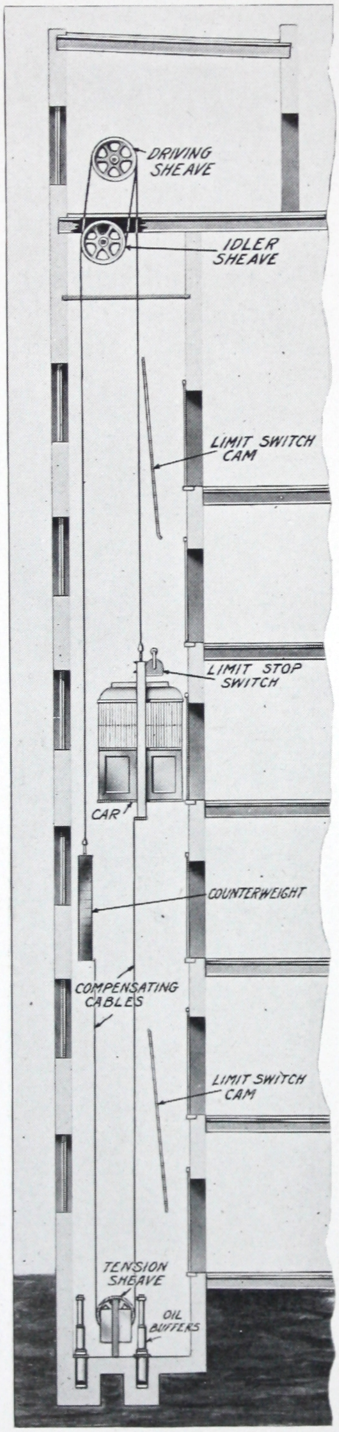


Plate 1291

ELEVATOR COUNTER-WEIGHTING

The elevator car usually weighs more than the rated capacity of the elevator. Passenger elevator cars weigh from 40 to 75 per cent more than their rated capacity. In order to reduce the size of the motor required to hoist the car and its load, counter-weights are used to balance the weight of the car, as well as a part of the load. To reduce the motor to the smallest possible size, and consequently reduce the cost for electric energy to a minimum, counter-weights should be used which will balance the car and the average load which it carries.

Different methods of counter-weighting are shown under the heading of Roping.

For most passenger elevator service, the average load is assumed to be about 40 per cent of the rated capacity of the elevator. Therefore, the counter-weighting ordinarily used on our elevators is that which will balance the car plus this average load. Every Llewellyn elevator is tested before being put into service to see that the counter-weight is of the proper value.

CABLE COMPENSATION

When the elevator car is at the bottom of the hoistway the weight of the hoisting cables is added to that of the car and its load. When the car is at the top this weight is added to the counter-weight. It can be seen, therefore, that if the cables weigh very much the load on the motor, with a fixed load in the car, will vary for different positions in the hoistway. In order to reduce these wide load fluctuations on the motor, and consequently reduce the size of motor required, cable compensation is employed on most of our average rise elevators. This compensation consists of a set of cables, which are usually duplicates of the hoisting cables, swinging from the bottom of the car to the lower end of the counter-weight, with a weighed sheave in the pit to hold them in tension. Plate 1291 shows the arrangement of these cables and the tension sheave in the hoistway.

THE ELEVATOR HOISTING MACHINE

Worm Gear Machines—General: The elevator winding drum or driving sheave is, in most instances, connected directly to the car by means of the hoisting ropes, and consequently operates at a slow speed. As the standard electric motor is inherently a high speed machine, it is obvious that, in order to operate these two devices together some form of gearing must be employed.

The spur gear is about the simplest form of gearing, but on account of the vibration caused by it it cannot ordinarily be used for elevator work. On account of its smoothness of operation and the absence of vibration, within certain limits, the worm gear is almost universally used on elevator machines where the car speed does not exceed approximately 400 feet per minute.

The Single Worm Gear Elevator Machine consists of a worm connected directly to the motor and meshing with a worm wheel. There is a double acting ball thrust bearing at one end of the worm shaft which balances the thrust produced by the rotation of the worm against the worm wheel.

The front cover of this bulletin shows a group of partly assembled single worm gear Llewellyn machines being built for traction drive. They are for heavy duty high speed passenger service. Page 27 shows the same size machine roped two to one and installed on a freight elevator with a capacity of 10,000 pounds. Plate 1191, Page 16, illustrates the use of the single gear machine with winding drum drive. Page 42 shows an installation of tandem gear traction machines for high speed passenger service.

Llewellyn Single Worm Gear Hoisting Machine: The worm and its shaft are turned from a solid steel forging. It runs in long bronze bearings, which hold it in perfect mesh with the worm wheel. The lateral thrust is taken on a large double-acting ball bearing held at one end of the worm and so arranged that it is very accessible and easily adjusted in case this should be necessary to compensate for wear.

The Worm Wheel is accurately machined from highest grade phosphor bronze. Its diameter is large, minimizing the effects of back lash, should this develop due to wear. The gear contact pressure is kept low, so that the oil film is maintained and cutting prevented.

The gear is connected to the driving sheave or drum by means of a driving spider. The driving force, therefore, is not dependent upon keys in the shaft. The Worm Wheel and driving sheave or drum, as the cast may be, are secured to accurately machined surfaces on either end of this driving spider by means of fitted bolts. The ends of these bolts are peened over so that it is impossible for the nuts to back off.

This driving spider is carried on a large steel shaft, which runs in bronze bearings of such proportions that the pressure per square inch of bearing surface is well within the limit ordinarily fixed for such bearings. This shaft is provided with large area thrust bearings.

The gear housing, base, outboard bearing and driving drum or sheave are of ample proportions to insure permanent alignment of all parts. They are made of the best grade of cast iron. All cable grooves on the sheave are cut to an accurate gauge, insuring equal diameters of all grooves and consequently equal tensions can be maintained in all cables on the traction type machines.

An oil reservoir is formed by the gear housing, so that the worm is continuously immersed in lubricant. The drum or sheave shaft bearing on the gear end has oil circulated through it from the main oil reservoir. The outboard bearing is usually of the chain oiled type.

Gearless Traction Machine: In the early days of the application of electric drive to elevators, the elevator machine was made to fit the electric motor as it was then constructed. The Gearless Traction Elevator Motor is the result of efforts to make a motor which is especially adapted to the requirements of high grade, high speed elevator service. The result is a machine of the simplest possible construction, most economical operation, maximum possible safety and smoothness in operation. It is an elevator machine which is in keeping with the high standards of modern building construction and requirements.

The machine, one size of which is illustrated by Plate 1247, Page 18, consists essentially of an electric motor, a traction driving sheave and a magnetically released spring actuated brake, all mounted on a single cast iron base. The motor, instead of being of the high speed type employed for geared elevators, operates at a very slow speed.

The parts entering into the construction of Llewellyn Gearless Traction Elevator Machines have been reduced to the fewest possible, at the same time, on account of their special design for this particular kind of elevator, absolute safety and perfection of operation have been secured.

The motor armature, driving sheave and brake pulley are all mounted on a continuous shaft. This shaft, which is of special steel and very large in diameter, serves only to support the load of the elevator and motor armature. The traction sheave and brake pulley are cast integral and bolted onto the armature spider, making a direct and safe drive from the motor armature to the elevator car without the use of keys.

The machine is provided with large chain oiled bearings, which, when once filled with oil, require very little attention thereafter. There are no balls or rollers in these bearings to give trouble or cause noise and vibration.

The construction is very compact, resulting in a machine which can be mounted several in a row and turned at any angle over the average elevator hatchway without interfering with each other.

The direct drive and consequent elimination of all gearing between the motor and driving sheave results in a machine of high efficiency, and absolutely prevents any possibility of vibration or noise.

Furthermore, there is nothing to wear out or give trouble, resulting in practically no cost for maintenance. On account of the very slow speed motor, the momentum is much less than with a small high speed motor, resulting in an elevator which can be handled very rapidly.

The Gearless Traction Elevator affords a very important safety feature, which the winding drum type elevator does not possess. If the car should, by some accident, go beyond its normal limits of travel, either it or the counter-weight, depending on whether it is traveling up or down, will strike the buffers. This reduces the tension in the cables to the point where the traction driving sheave will slip inside of the cables, allowing the motor to continue to revolve without subjecting the cables to dangerous strain.

The methods of roping the Gearless Traction Elevator are the same as for the geared traction machine. These are shown on Pages 5 to 9 inclusive. Page 50 shows a battery of these machines installed in a large office building.

In order to obtain a moderate priced, moderate speed elevator of large capacity, with all of the smooth riding qualities, high efficiency and simplicity, of the one to one gearless traction elevator, a smaller motor has been developed which resembles the large one to one elevator motors, but which runs at a higher speed and

which drives its car through a two to one roping, i. e., the rope speed on the motor sheave is twice the car speed. This roping is shown on Page 8, Plate 1294C. Page 43 shows an installation of these machines in a large department store.

MOTORS FOR GEARED ELEVATORS

The motors used on Llewellyn geared elevators are of the highest obtainable quality, and are the result of many years of experience in the design and construction of motors for elevator service.

The rotating elements of all motors are long and small in diameter, permitting quick acceleration, deceleration and reversing, with a minimum expenditure of electric energy and heating of the windings. As from 40 to 80 per cent of the inertia of the moving parts of a geared elevator is found in the motor rotor, this is a very important feature.

The efficiency of these motors is high and the speed regulation is good, giving approximately constant speed regardless of the load.

The line of both direct and alternating current motors which we have to choose from is very complete, permitting the selection of a motor to exactly meet the particular requirements of each elevator installation. This is very important, as the motor requirements of elevators vary over a wide range, and the successful operation of the elevator depends largely on the selection and use of the proper motor.

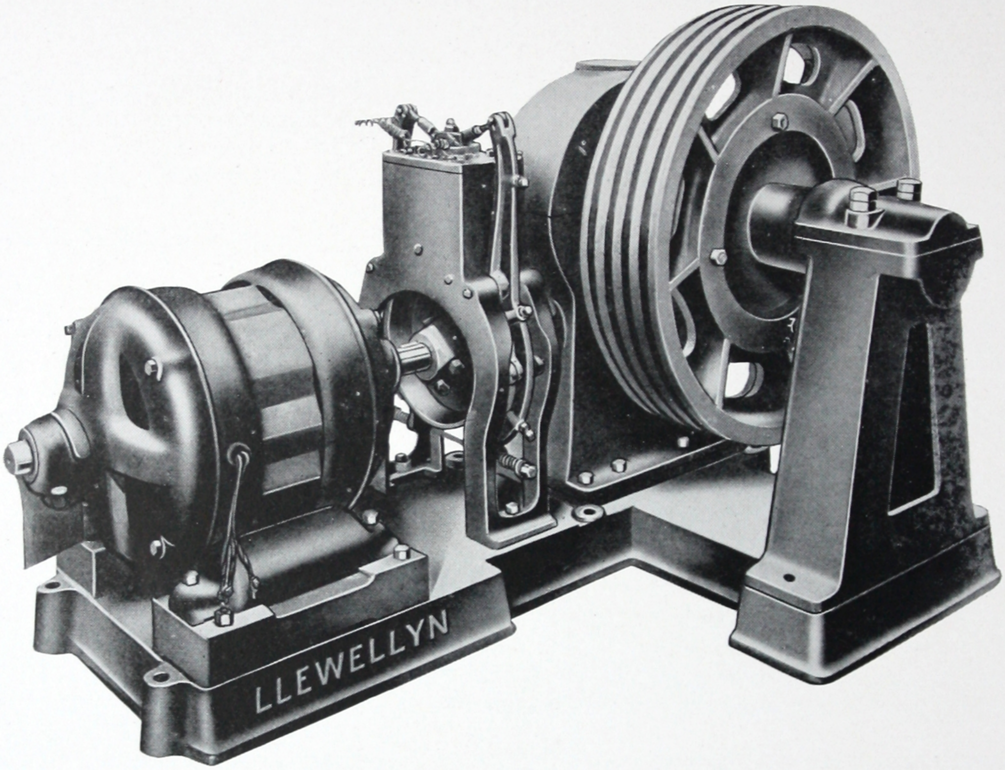


Plate 1276

No. 101 WORM GEAR ELEVATOR MACHINE

As shown it is equipped with an A.C. motor, V groove driving sheave and arranged for mounting over head.

The No. 101 Elevator Hoisting Machine is designed for light loads and moderate speeds and is the smallest standard elevator machine we build.

It is equally well adapted to passenger and freight service and can be arranged for any of the various methods of control.

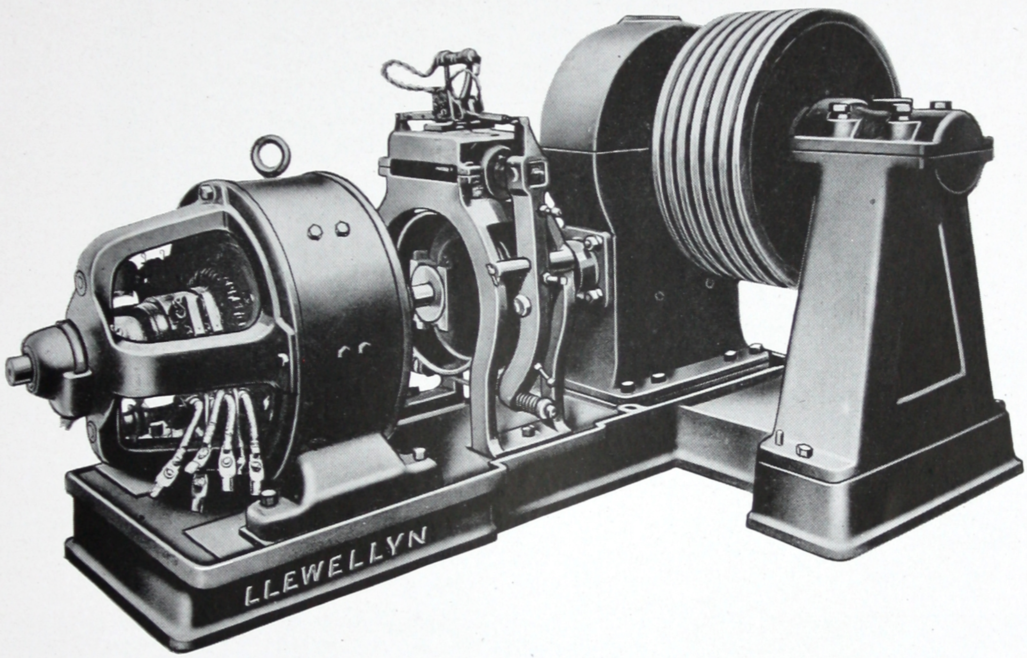


Plate 1272

No. 102 WORM GEAR ELEVATOR MACHINE

This machine is shown equipped with D.C. motor, V groove driving sheave and arranged for mounting over head.

It is suitable for either passenger or freight service and can be arranged for any of the various methods of control.

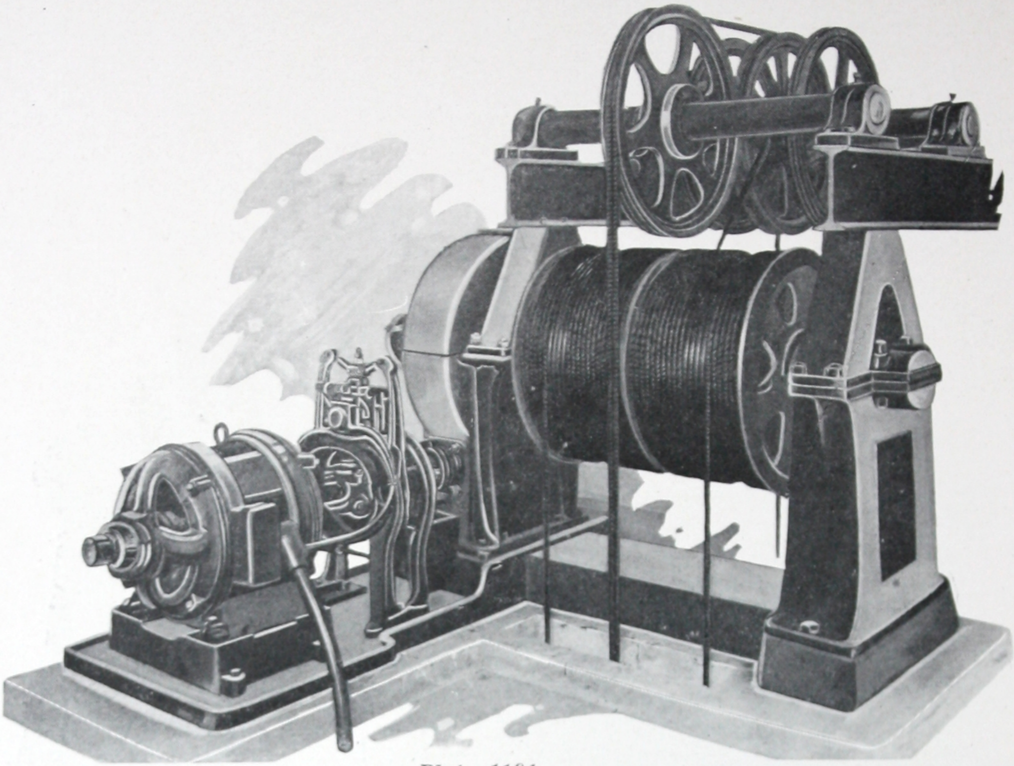


Plate 1191

No. 104 ELEVATOR MACHINE

Winding Drum Type Located Over Hatchway and Equipped With Alternating Current Motor Drive Installed on a Large Freight Elevator, which is provided with both Drum and Car Counter-Weights.

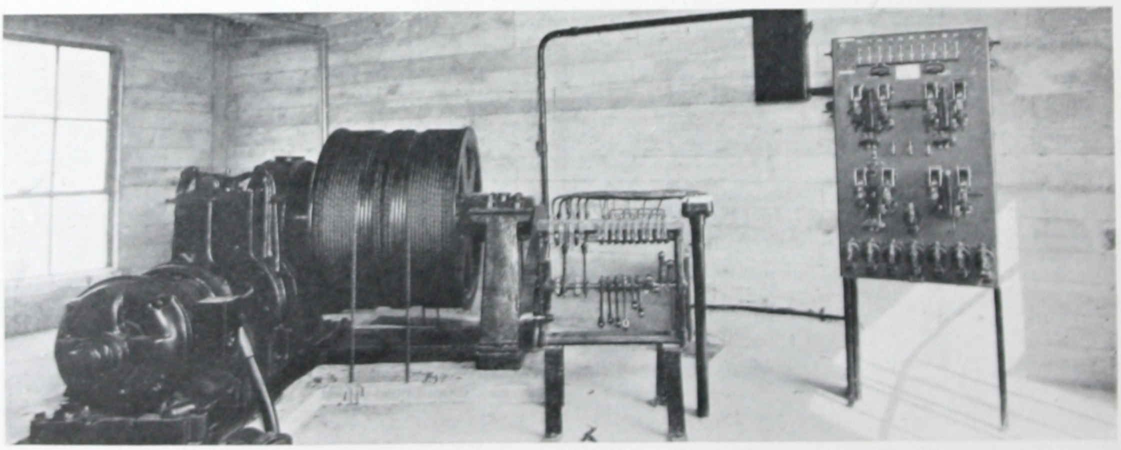


Plate 1190

No. 102 ELEVATOR MACHINE

Winding Drum Type Located over Hatchway and Equipped with Alternating Current Motor Drive. Combination Car Switch and Push Button Control for Passenger Service. Drum Counter-weight Only is Used.

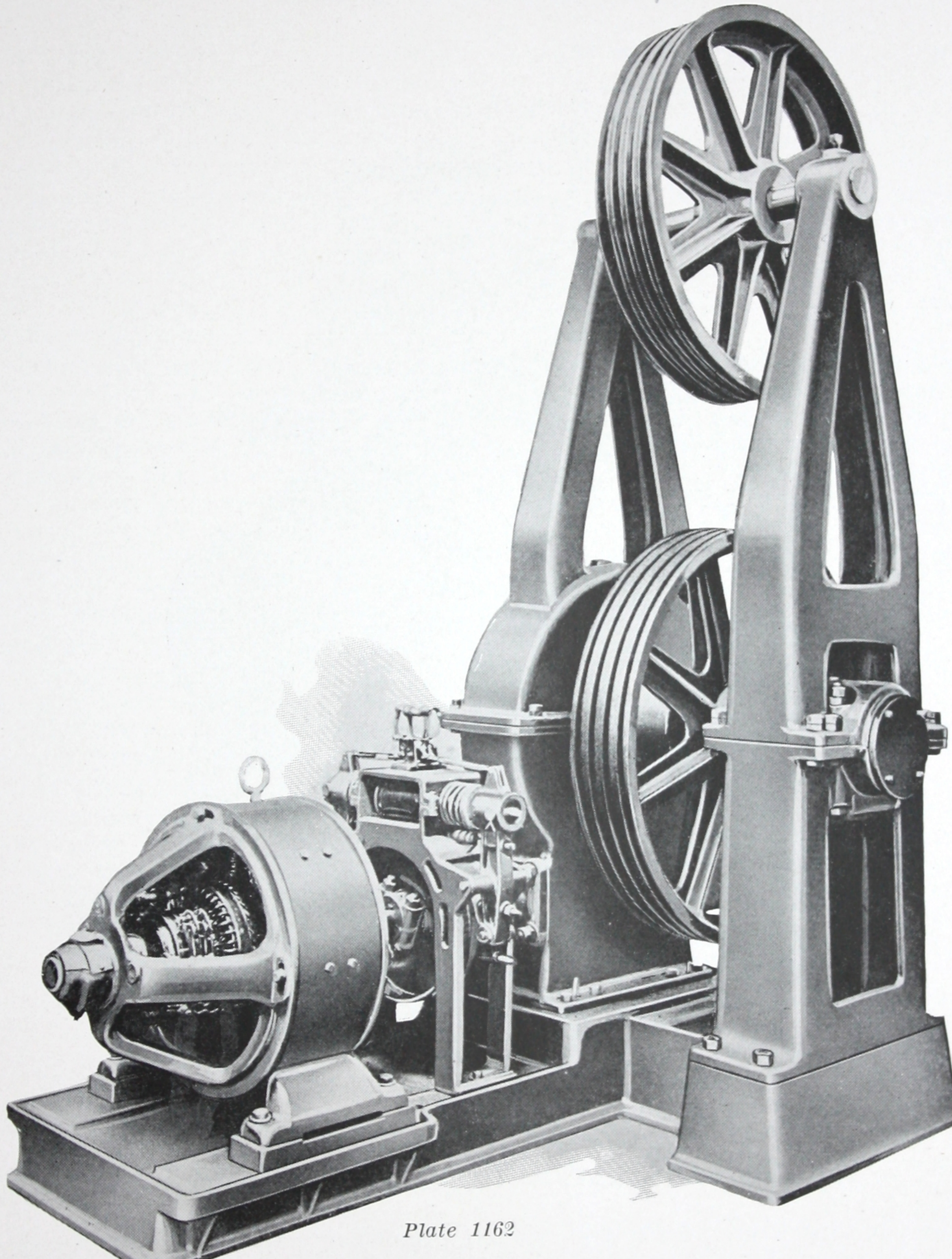


Plate 1162

No. 105 WORM GEAR ELEVATOR MACHINE

As shown it is equipped with a D.C. motor, V groove driving sheave and arranged for basement mounting.

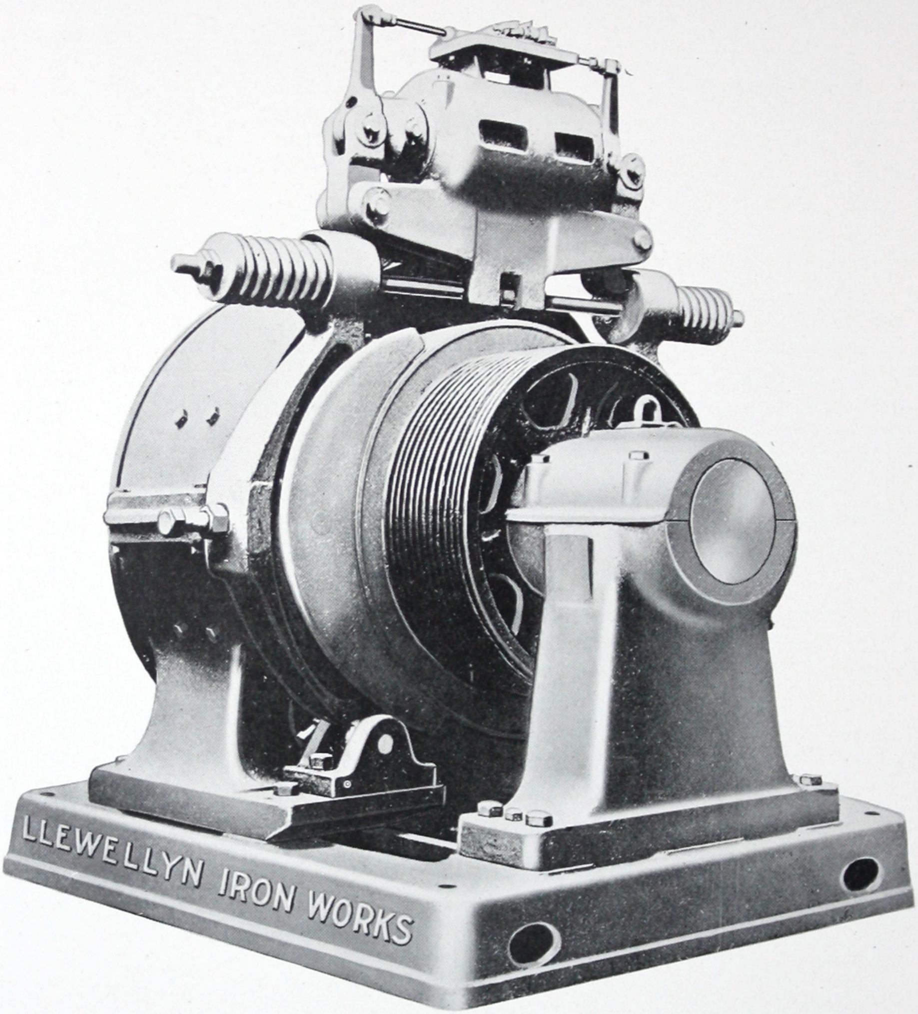


Plate 1247

No. 215 GEARLESS TRACTION ELEVATOR MACHINE

This machine is used for heavy capacity passenger elevators where the speeds range from 400 to 600 feet a minute.

ELEVATOR CONTROLLERS

General Description: The controller is one of the most important and at the same time, perhaps, the most complicated part of the elevator equipment. The smooth operation of the elevator car is largely dependent upon its functioning properly.

The elevator controller, besides being designed to safeguard the motor, has to be designed so that the car will start, run and stop smoothly, so that the passengers will not experience unpleasant shocks and sensations when the controller is operating. Llewellyn controllers are the result of twenty-five years of experience along this line. They are of the very latest and most improved design and the best that can be had for elevator service. Our chief aim in the design of these controllers has been to obtain: (a) safety; (b) reliability; (c) smooth operation; (d) simplicty, and (e) economical operation.

Practically all of our elevator controllers are of the Full-Magnetic type. They are usually operated by a master controller located in the car, but the actual motor connections are made by a group of automatically operated magnetic contactors located near the motor, and which are connected to the master controller, or car switch, through small flexible wires attached to the car. The operator has full control over the movements and speed of the car, but the rate of starting, changing speeds, stopping, and reversing, is determined and limited by the automatic contactors themselves. The rate of operation of the accelerating magnetic contactors, in most cases, is controlled by a special, reliable master time relay.

On direct current controllers, automatic deceleration and dynamic braking are accomplished by magnetically timed contactors.

All wiring on the backs of our controllers is done in a neat and orderly manner, and every wire is securely fastened in its place. Every controller is checked carefully, and given a thorough test and inspection by the engineering department before it is released from the shop.

The main resistors are separately mounted, making the back of the control panel very accessible and easy to keep clean. It is possible for us to build and mount these various control units separately and in the most convenient and accessible locations on account of the fact that practically all of our elevators are installed by our own men, who are thoroughly familiar with them. They are assisted by complete drawings and diagrams which are made for each individual elevator installation. Every wire is tagged with an identification mark, which corresponds with the markings on the drawings, making it possible for anyone, even though he may not be familiar with the elevator, to trace out and quickly correct trouble in the wiring, should it develop.

Our line of elevator controllers, both A. C. and D. C. is very complete. There is not a condition of standard elevator control which cannot be met by our line of controllers.

Functions Performed: The principal functions of these elevator controllers are as follows:

1. To start the motor and accelerate it to full speed in either the up or the down direction, and to stop it at the will of the operator.

2. To control the speed of the elevator at the will of the operator.

3. To automatically stop the elevator at its normal limits of travel.

4. To provide means, which is not a part of the regular controlling apparatus, for cutting all power off of the motor and applying the electrical and mechanical

brakes in case of an emergency, or in case the car goes beyond its normal limits of travel or its speed becomes excessive.

5. To provide brakes which will positively and smoothly stop the car and hold it securely at the landings.

Methods of Operation: The principal methods employed for operating electric elevators are as follows:

Hand Rope and Lever Control.

Car Switch Control.

Push Button Control.

Dual, or Combination Car Switch and Push Button Control.

Hand Rope Control: This type of control employs a rope running the full length of the hoistway in the form of a loop. While the car is in operation, this rope is stationary. In order to start, the operator pulls on the rope in the opposite direction from that in which it is desired to move the car. When the desired landing is reached, the operator takes hold of the rope, and the movement of the car pulls it in the proper direction for stopping. This method of operation is used for slow speed freight elevators. A lever or hand wheel may be used for manipulating the rope. The controller for this kind of operation is what is known as semi-magnetic; that is, the operating rope is attached to a drum switch which makes the connections for reversing the motor while magnetic contactors are employed to make and break the line circuits, and to cut out the resistance and accelerate the motor automatically. Plate 1277 Page 23 shows this type of controller. The cut shows the travelling nut limit device, which is attached to winding drum machines and which operates the drum switch through chain drive, to stop the car in case it goes beyond its normal limits of travel.

Car Switch Control: This is the most common method of operating electric elevators. As its name implies, it consists of a master controller, or Car Switch located in the car and connected electrically through small flexible wires to the main controller, which is usually located near the elevator driving motor. This master switch carries only the current required for the magnetic contactors on the controller proper, which in turn make and break the main power circuits and automatically accelerate or decelerate the car. The master switch is used only to determine the direction of travel and to select the proper operating speed. Plate 1283, Page 31 shows one of these car switches as used for high-speed passenger elevator service.

Our Direct Current Car Switch Controllers are designed for use on elevators with car speeds from 50 to 600 feet per minute. They are divided into three general classes.

(a) Up to about 125 feet per minute, single speed controllers are used, with dynamic braking in the off position only.

(b) For higher speeds, up to about 200 feet per minute, a controller giving two points of speed control is used. This controller provides slow-down and dynamic braking. Plate 1280, Page 25 shows this controller as built for dual control.

(c) For geared elevators, running from 200 to 400 feet per minute, motors are used which give a wide range of speed adjustment by shunt field control. The controllers used with these motors are provided with from three to five running speeds

and graduated dynamic braking. Plate 1279, Page 24 shows one of these controllers designed for motors having a speed range of two to one. Five speeds are provided, giving smooth acceleration and deceleration.

Push Button Control: This method of controlling an elevator car has a particular field of application in apartment-house, small hotels, stores, clubs, private residences, etc., where the service does not warrant the expense of a regular operator. On account of the fact that these elevators are operated by their passengers, who, in general, are entirely unfamiliar with the operation of elevators, it is most essential that the apparatus be simple, reliable, and safe beyond any doubt.

Llewellyn Push Button elevator controllers, provide the following complete requirements of elevators for this kind of service: (a) That the passenger by pressing a button near the elevator, may bring the car, if it is not in use, to the floor on which he happens to be; (b) That the passenger may open the door, enter the car and, by pressing one of a group of buttons, send it to any desired landing without interference from anyone else who might desire its use. (c) That all hoistway doors, except the one opposite which the car is standing, must be locked at all times.

From the time the passenger presses the button in the hall, calling the car, until he has been taken to his destination, and closed the doors behind him, he is in absolute control of the car, and no one else can interfere with its operation. The car will not leave a floor until the hoistway door at the floor has been closed and locked. Pressing a button, either in the car or outside, locks the hoistway door electrically before the car starts. If the lock should fail to function properly, the car will not start. A gate is also provided on the car platform, making it impossible for passengers to be injured when the car is moving in the hoistway. The car cannot be started until this gate is closed.

There is a button grouped with the regular control buttons in the car, by means of which the car can be stopped at the will of the passenger. This may be used to change the destination of the car, or to stop it in case of an emergency. There is also another button in the car connected to a bell suitably located outside of the elevator, by means of which help can be summoned in case the power should fail when the car is not opposite a landing. All of the safety features used on standard elevators have been built into these elevators. Not a single possible safety feature has been omitted in their design.

The controllers for push button operated elevators are, in general, about the same as those used for car switch control.

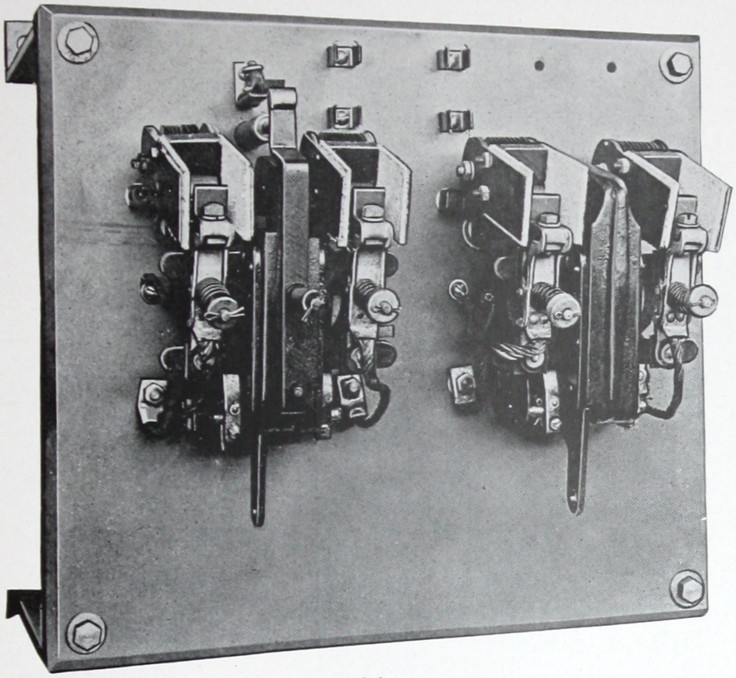
Where single speed alternating current motors are used on push button operated elevators the full load hoisting speed should be limited to about 125 feet per minute, as satisfactory stops cannot be made with higher car speeds. Direct current and two-speed alternating current push button control installations can be made with car speeds as high as 300 feet per minute.

Dual Control: Dual, or combination car switch and push button control fills a demand where the service justifies the employment of an operator for only part of the time that the elevator must be in service. It is a control embodying all the features of both the car switch and the push button controlled elevators. The car is provided with the usual car switch, or master controller, as well as the group of buttons employed for push button service. The controller proper differs from the straight push button controller in that it is provided with a multiple pole, double throw switch for changing from one form of control to the other. When this switch

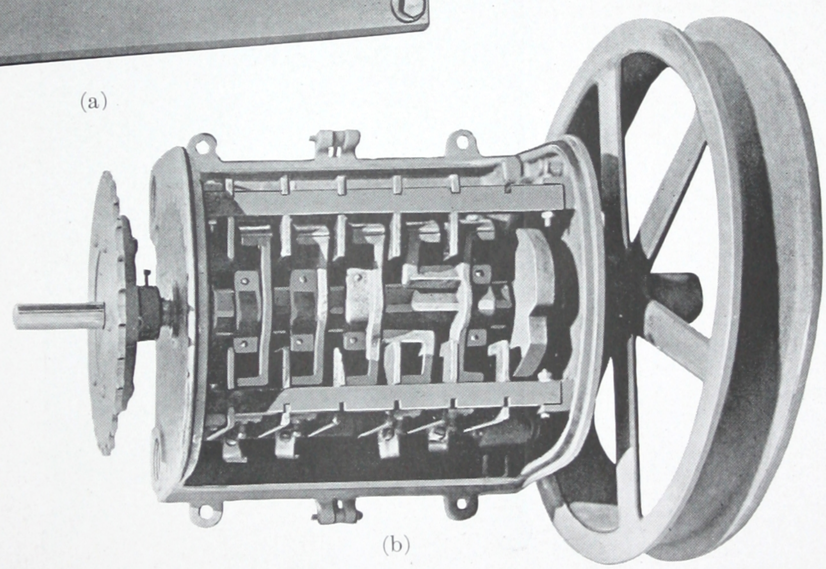
is in the position for car switch control, the hall buttons, which are used to call the car when the elevator is under push button control, serve to signal the operator on the annunciator, which is a part of the equipment in the car of every car switch operated elevator. Plate 1280, Page 25 shows a dual controller for direct current service. It is a two-speed type, suitable for a maximum speed of 175 feet per minute. Plate 1281, Page 26 shows a similar controller designed for single speed alternating current service with a maximum speed of approximately 125 feet per minute.

Automatic Leveling Controllers: For freight service, the loading and unloading of elevators is frequently done by means of hand trucks, push carts and other rolling vehicles. For such work, it is highly desirable to have the elevator platform stop level with the floor within a small fraction of an inch. This is very difficult to accomplish with the standard hand rope, push button or car switch operated car. To meet the requirements of this service we have developed a special controller which employs a small motor driven booster for revolving the main elevator motor armature at a very slow speed during the leveling operations.

A combination car switch and push button controlled freight elevator of this automatic leveling type is shown on Page 27. It has a capacity of 10,000 pounds at a speed of 100 feet per minute. The mechanical construction, as can be seen, is extremely simple. As the slow speed is obtained electrically from the small booster set, no special construction is required in the hoisting machine.



(a)



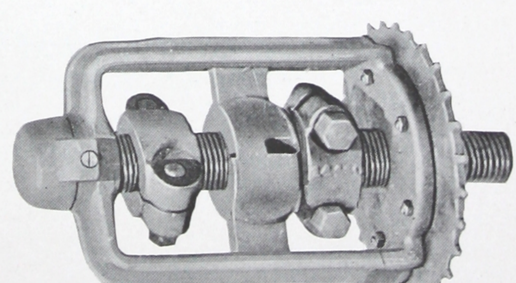
(b)

Plate 1277

HAND ROPE CONTROLLER FOR USE ON ALTERNATING CURRENT

It consists of:

- (a) Magnetic Contractor Panel.
- (b) Sheave operated Reverse Switch.
- (c) Traveling Nut Limit Device.



(c)

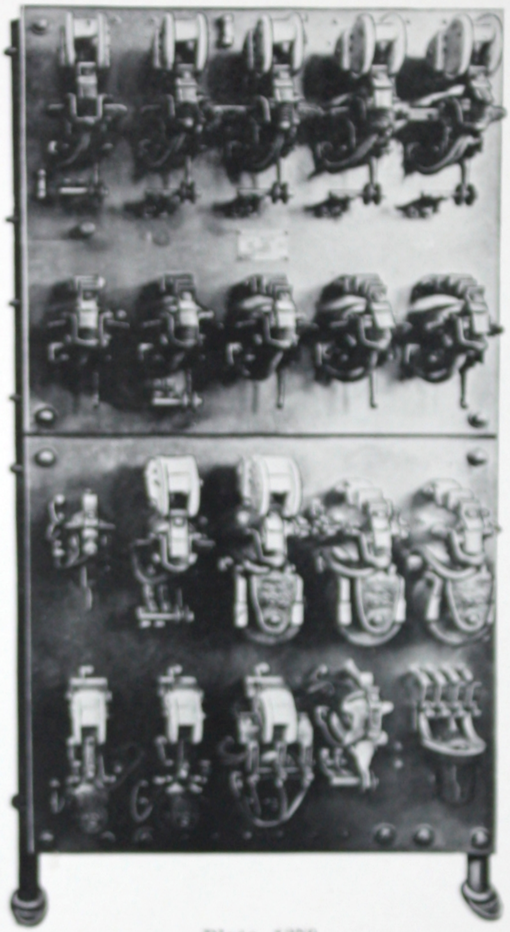


Plate 1279

DIRECT CURRENT ELEVATOR CONTROLLER

For car switch operation of high speed Worm Geared Elevators

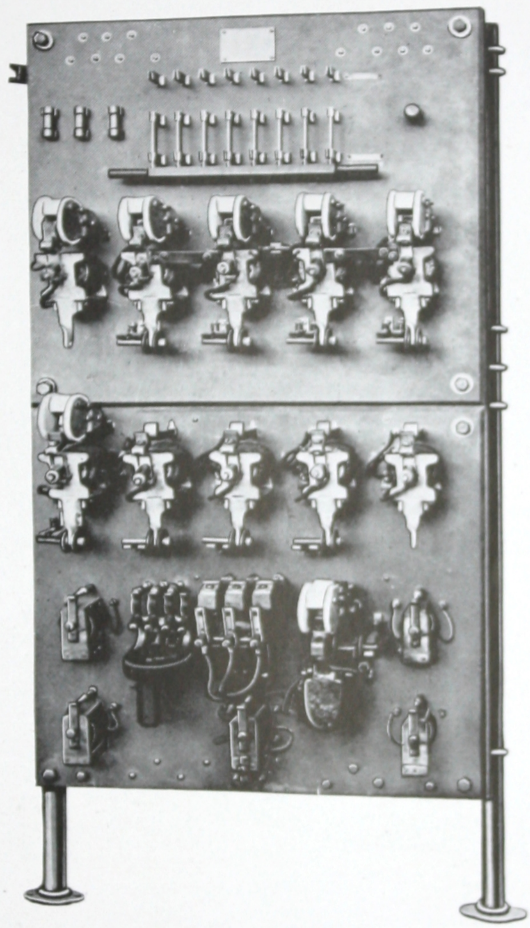


Plate 1280

DIRECT CURRENT ELEVATOR CONTROLLER

For Combination Car Switch and Push Button Operation of Moderate Speed Elevators

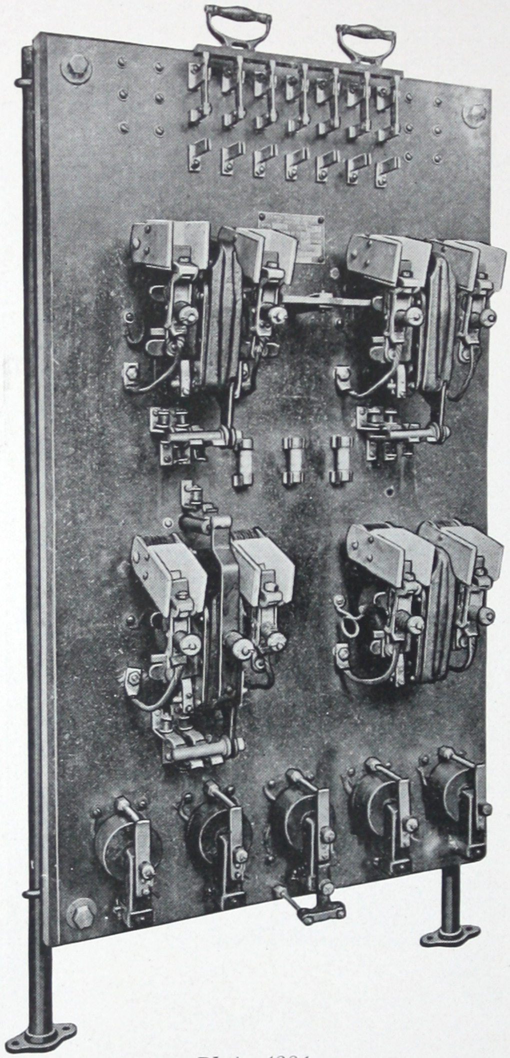
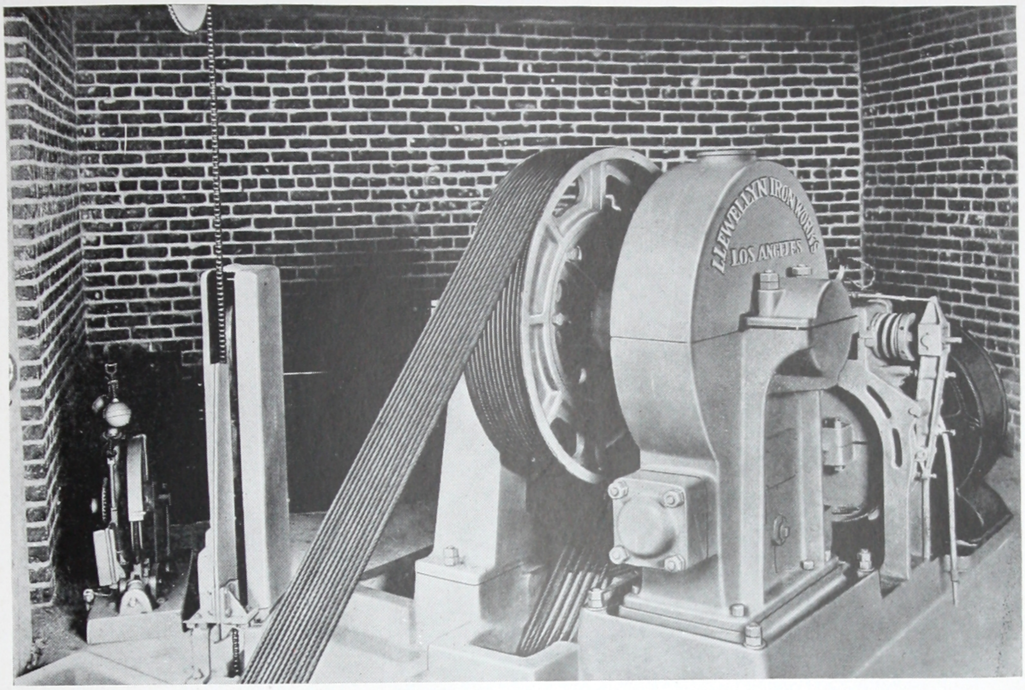
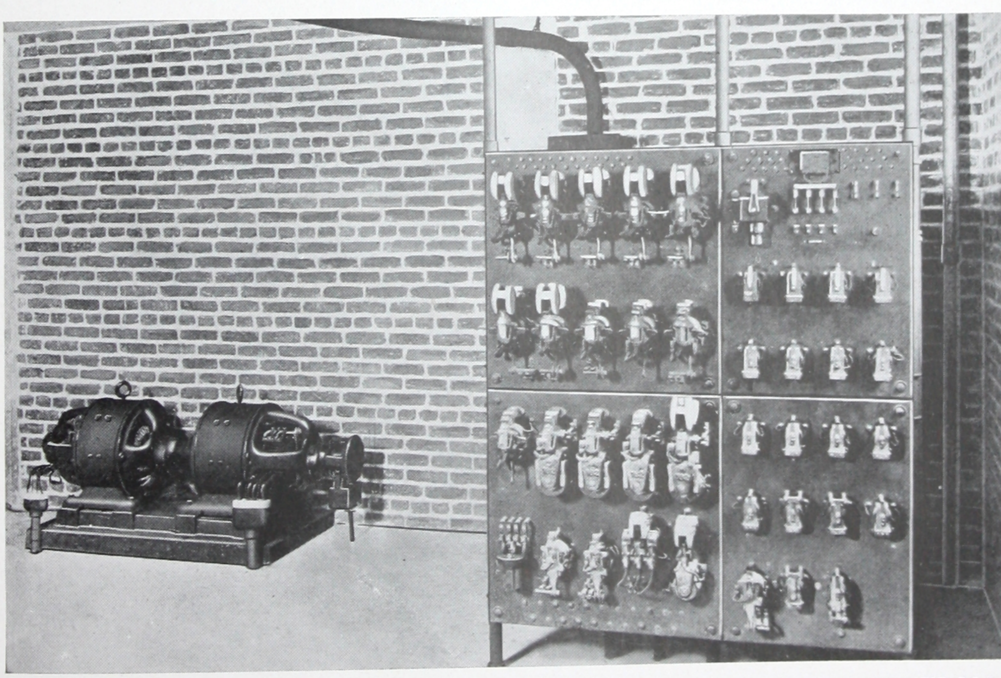


Plate 1281

ALTERNATING CURRENT ELEVATOR CONTROLLER

For Combination Car Switch and Push Button Operation with Squirrel Cage Induction Motor





DIRECT CURRENT, COMBINATION CAR SWITCH AND PUSH BUTTON CONTROLLED AUTOMATIC LEVELING FREIGHT ELEVATOR

No. 105 Elevator Hoisting Machine with double wrap traction drive and 2 to 1 roping. The small motor-generator set is for supplying low voltage current for leveling.

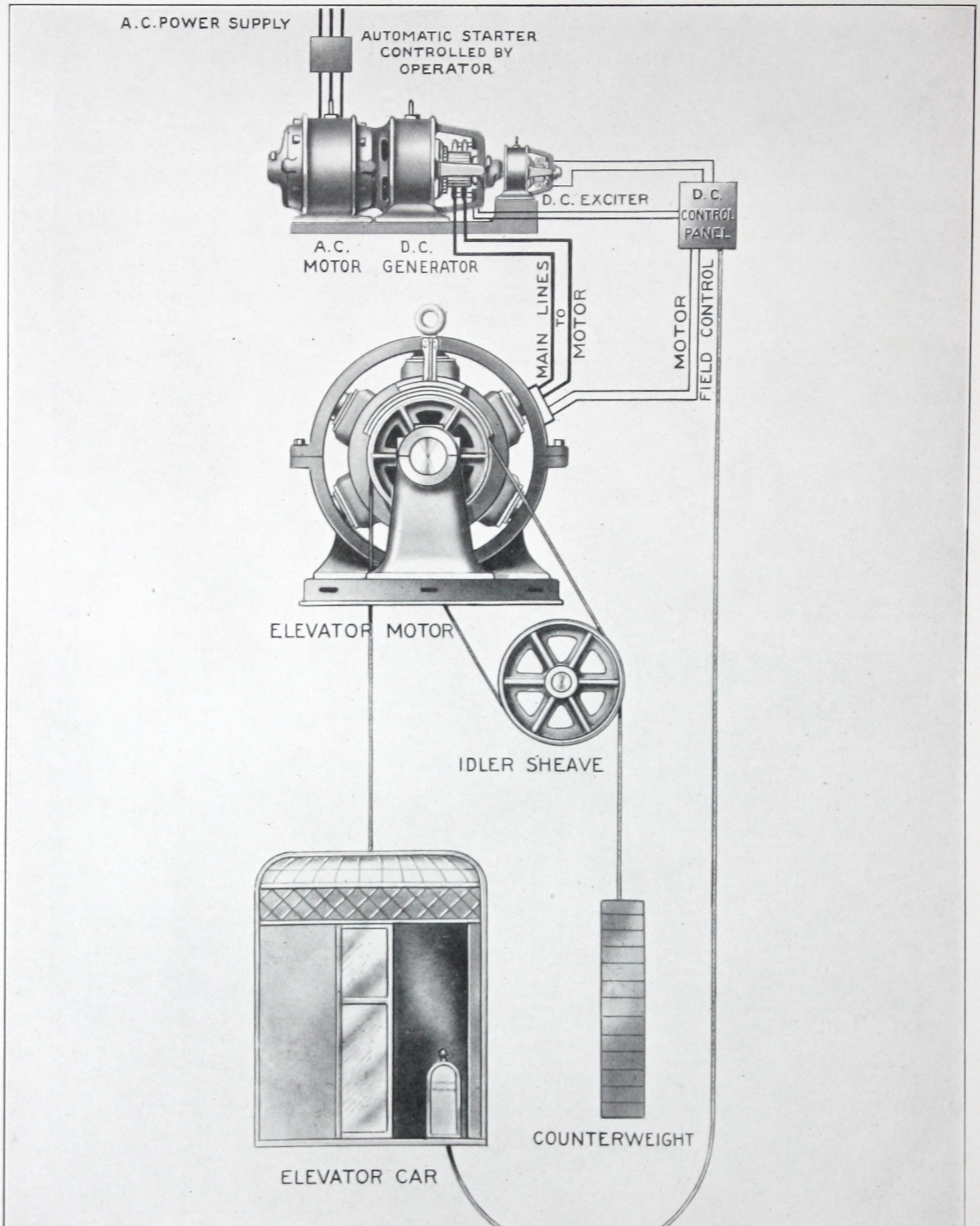


Plate 1615

LLEWELLYN VARIABLE VOLTAGE CONTROL SYSTEM

VARIABLE VOLTAGE CONTROL

The ordinary method of controlling an elevator motor is one wherein the current admitted to the motor during the starting period is limited and controlled by inserting resistance in series with the motor, this resistance being gradually cut out as the motor is accelerated. To slow the motor down and stop it, this series resistance is reinserted and additional resistance is placed in shunt with the motor armature, thereby causing it to act as a generator, feeding current into this resistor while slowing down and while lowering a heavy load. These operations are all done in steps, which, with the ordinary method of control, produce unpleasant jerks in the elevator car.

In the Llewellyn Variable Voltage system of control each elevator is provided with a motor driven generator. The Generator armature and armature of the elevator motor which it drives, are permanently connected in series, there being no intervening control resistance.

Starting, stopping and controlling the speed of the elevator motor are accomplished by reversing and varying the strength of the field of the generator. These operations are accomplished by making the car switch a combination reversing switch and field rheostat. The reversing contacts in this car switch are the same as those in the standard car switch and serve to make and break the circuits to magnet contactors which are in the field circuit of the generator.

The car is started by moving the switch to the first point, which energizes the field of the generator in the proper direction, with all the resistance of the field resistor in this circuit. As the car switch is advanced, this resistance is diminished, causing the generator voltage and car speed to increase until the car switch has been thrown full stroke, at which time all of the resistance is cut out of the generator field circuit and the car is running full speed. To slow the car down and stop it, the resistance is reinserted in the field of the generator by moving the car switch back towards the neutral position. This causes the generator voltage to be reduced below that of the elevator motor, which causes it to operate as a generator and the generator to operate as a motor, returning power to the line through its driving motor. This operation produces very effective regenerative braking without wasting any energy in resistance.

As can be seen from this description and the diagram on the opposite page, there is no resistance in the main power circuits, and consequently a minimum amount of power is wasted in the control of the elevator motor. As the control of the elevator motor is through the field of its generator, the acceleration and deceleration are without steps and exceedingly smooth. The current in the elevator motor is reduced gradually to zero when the car switch is thrown to the off position, causing the car to stop smoothly and without shock. The time element of the generator field is such that the car switch can be thrown full stroke in either direction without causing an excessive rate of acceleration or deceleration; therefore no current limit relays or dashpots are required to govern the rate of acceleration or deceleration of the car, this being an inherent characteristic of this system of control.

Some of the differences between this system of control and the rheostatic type of control and the advantages of the former are as follows:

VARIABLE VOLTAGE CONTROL	ORDINARY RHEOSTATIC CONTROL
Smooth Operation	
1. As the control is accomplished through the field of the generator, acceleration and deceleration are without steps and exceedingly smooth. Power is applied and cut off gradually, starting and stopping the car without shocks.	1a. Step by step acceleration and deceleration which in most makes of control produce unpleasant jerks in the car.
Good Speed Regulation	
2. As there is no resistance in the main circuits, the speed regulation is exceedingly good on all points of the car switch. Speed is approximately the same on any given point of the car switch regardless of the load. The car barely creeps on the slowest speed and accurate landings can be made regardless of the load.	2a. Speed regulation is extremely poor, the position of the car switch being no indication of the speed of the car with different loads. For instance, controllers are ordinarily adjusted to start full load on the third point of the car switch, on which point the load is hoisted at a very slow speed. Coming down on even the first point with this same load the speed is entirely too high to make accurate landing until the operator has become expert in handling his car.
Efficiency	
3. As, at no point on the car switch is there any resistance introduced into the main circuit, power is required only in proportion to the load and speed. If the load overhauls the motor, energy is returned to the line, even on the slow speed points.	3a. The motor starts through a resistance in series with its armature and at the instant of starting, the efficiency is zero, rising gradually as the speed increases. At all speeds, except normal, practically full load current is drawn from the line. This causes the amount of energy required for operating the elevator to be abnormally high if it is operated on the slow speed points any length of time, which is usually the case when traffic is light and a fixed schedule is to be maintained.
Number of Speeds	
4. There are eighteen positive speeds to select from and the efficiency of operation is high regardless of the speed at which the car is operated.	4a. Only five or six speeds are available and all except the highest are very inefficient.

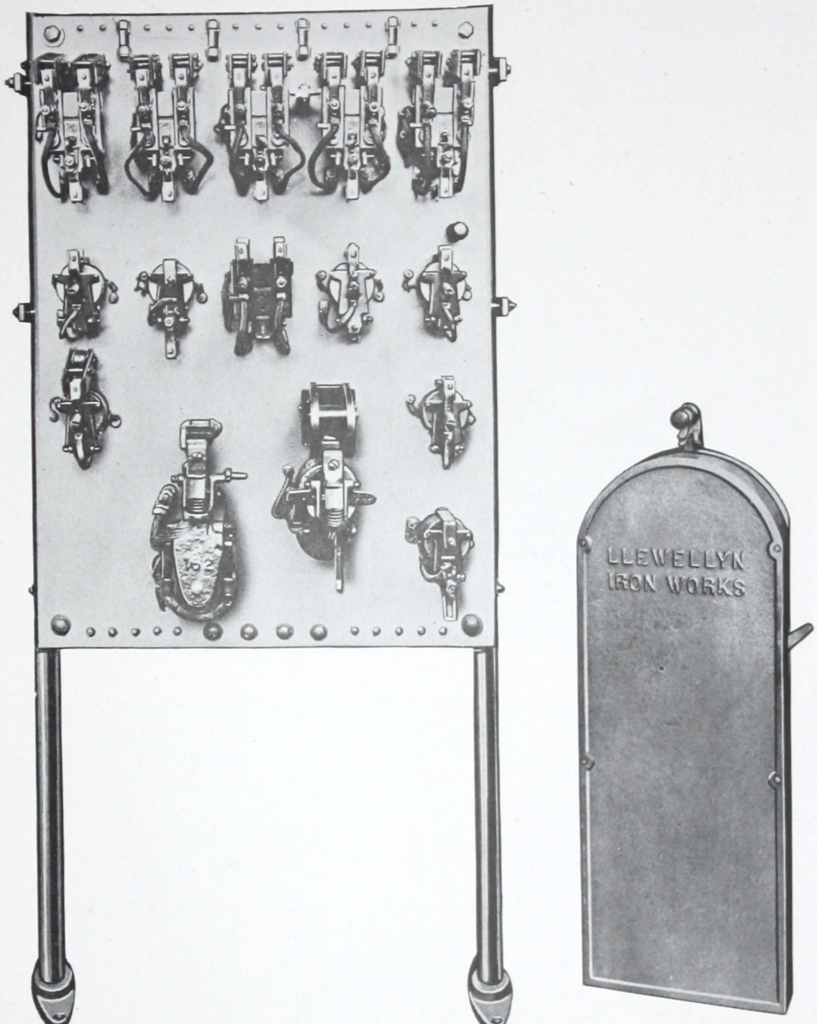
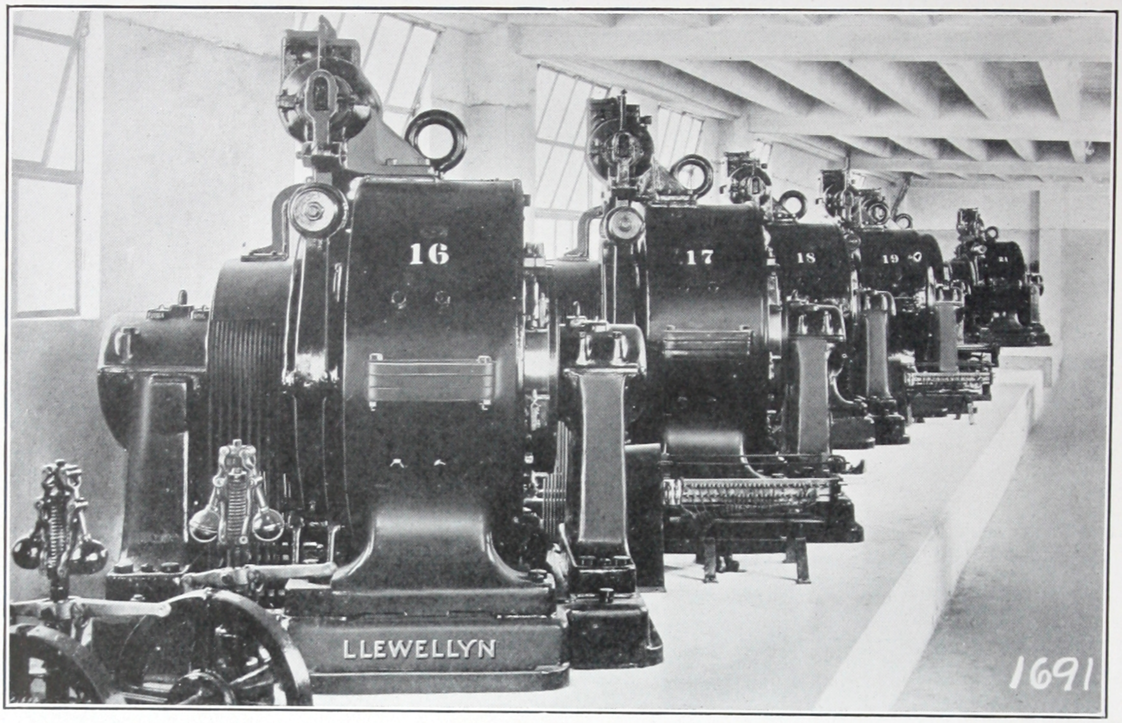


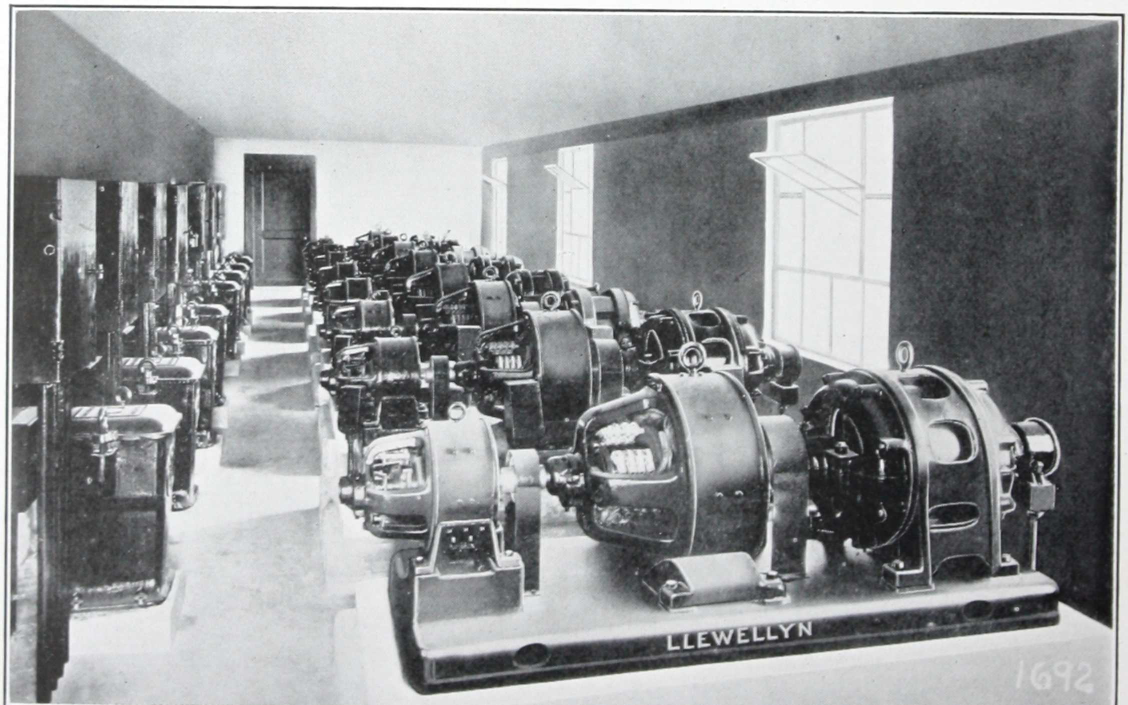
Plate 1283

Control panel and car switch for variable voltage control system

Besides being inherently more economical in energy consumption than the rheostatic type of control, our Variable Voltage control affects a further saving, due to the fact that alternating current power is usually used where this system of control is employed. This, in itself, results in a saving of approximately 20 per cent, which is usually the difference between the A. C. and the D. C. power rates.

With the rheostatic type of controller the current drawn from the line while the car is being accelerated is about twice full load current. This throws very heavy momentary and intermittent loads on the line, which are very objectionable to the power company or the elevator owner, in case he takes power from his own plant. When a Llewellyn Variable Voltage controlled elevator car is accelerated under full load





An Installation of Eight Variable Voltage Gearless Traction Elevators

the maximum value to which the power drawn from the line rises is only from 10 to 25 per cent above the full load running value, instead of 100 per cent in the case of the rheostatic control.

On account of the positive inherent regenerative braking obtained with Variable Voltage Control, the car is automatically stopped positively at the terminal landings regardless of the load or the position of the car switch.

The use of alternating current direct on high speed elevators is very unsatisfactory and uneconomical. Our Variable Voltage system of control makes it possible to obtain the highest class of elevator service, even though alternating current may be the only available power.

Our Variable Voltage controllers can be so arranged that in order to change from 50 to 60 cycle service, or vice versa, it is only necessary to throw a double throw switch, which is located near the motor generator set.

Variable Voltage Control is not limited to new elevator installations. It can be applied to practically any existing elevator, especially the gearless traction type, giving them all of the perfect controlling and smooth riding qualities of an original variable voltage installation, at a very reasonable cost.

ELEVATOR BRAKES

While the brake is a small part of an elevator machine, it is an exceedingly important part. Because of the frequency of starts and stops, it is very essential that the car be brought to rest quickly and without shock or jar to the passengers. It is also just as important that the car be held securely in its position in the hoistway while passengers are leaving and entering it.

Modern elevator brakes are of three general types: Magnetic, dynamic and regenerative.

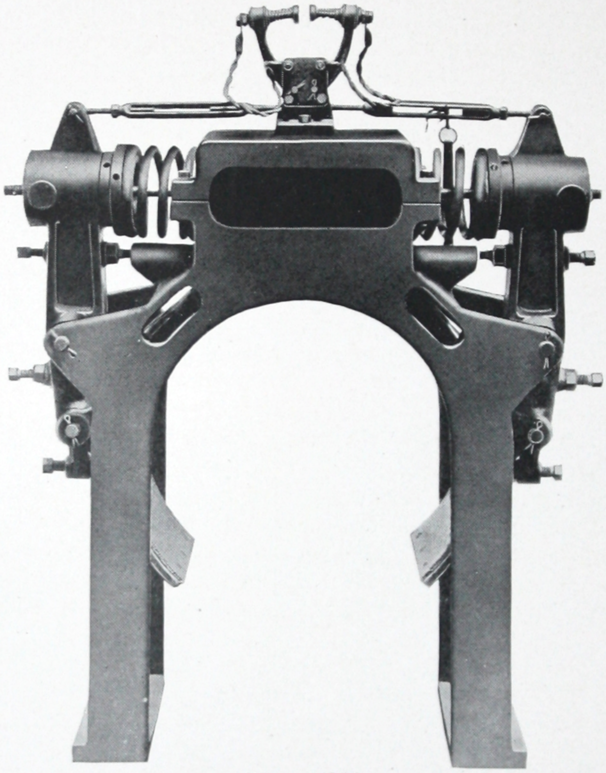


Plate 1234

Direct Current Magnetic Friction Brake

Magnetic Brake: Many elevators employ the magnetic brake to stop the car, and all of them depend upon it to hold the car, once it has been stopped. Most magnetic brakes consist of two shoes, normally held against the opposite sides of an iron or steel pully by helical springs.

This brake pulley is usually mounted upon the motor shaft. When the car is running, these shoes are forced out of contact with the brake wheel by an electro-magnet. The motor and brake are almost invariably energized simultaneously, so that it is not possible to release the brakes without energizing the motor, or vice versa.

Plate 1234 shows the construction of a small direct current magnetic brake as used on a geared elevator machine, while Plate 1247, Page 18 illustrates very clearly the

construction of the large direct current brakes used on the gearless traction elevator machines. In the latter case, the electro-magnet is mounted on top of the motor.

One of our type K alternating current brakes is shown on Plate 1276, Page 14. It is compact, neat, and has all of its electrical working parts immersed in oil. The magnet oil chamber is cast integral with the brake stand. It is oil tight and one filling of oil will last indefinitely.

Dynamic Braking: Any direct current motor is also a good electric generator. Power is required to drive a generator. Advantage of this feature is taken in the application of what is known as dynamic braking to elevators. This form of braking will not bring an elevator to rest, especially if the load is overhauling, but it reduces the speed very smoothly and quickly to a point where the magnetic shoe brake, with a very moderate pressure on the shoes, can stop the car without shock.

On all Llewellyn moderate and high speed direct current elevators, where the rheostatic type of controller is employed, the dynamic braking resistor, which is placed across the armature, is reduced in value as the car speed slows down, thereby giving an approximately constant retarding torque. This stops the car quickly and very smoothly.

Regenerative Braking: Regenerative braking is similar to dynamic braking, except, instead of wasting the electric energy stored in the movingmass of the elevator in a resistor, it is returned to the power supply lines while slowing down and stopping the car. Instead of flowing back into the power system and running the meter backwards in doing so, it may be absorbed by other elevators in the same building which may happen to be running under load. In either case the regenerated energy serves to reduce the amount of the power bill.

This form of braking is what limits and governs the speed of our high-speed elevators, especially the gearless traction type. This same kind of braking takes place on a large scale when our Variable Voltage controlled elevators are slowed down and stopped. Most of the energy stored in the moving mass of the elevator is returned to the supply line. Thus, with this system of control, besides obtaining ideal control and perfect riding qual ties, the large amount of electric energy ordinarily wasted in the starting and stopping resistors is returned to the line, or to other elevators, and conserved.

SAFETY DEVICES

Every precaution is taken in the design of Llewellyn elevators to provide safety features which will prevent accidents of any kind. In the first place, all of the elevator parts are very liberally designed with a large factor of safety, but in case any of these parts should fail, due to neglect or some unavoidable reason, there is a safety device which safeguards the passengers. They are both mechanical and electrical in nature as shown by the following list:

Guide Grip Safety with its actuating speed limit governor and "stop" switch.
Over Speed Switch.
Car Safety Switch.
Terminal Slow-down and Limit Switches.
Over-travel Limit Switches.
Slack Cable Switch.
Door Switches.
Compensating Cable Sheave Switch.
Reverse Phase Relay.
Car and Counter-weight Buffers.

Guide Grip Safety and Governor: Guide grip safety devices are of the most reliable types. The numerous tests conducted upon them have proved their reliability. For steel guide rails, two types are used. For very slow speed elevators, we use a milled roller instantaneous acting type, while for moderate and high speed elevators our All Steel Wedge Clamp type is used. See plate 1156, Page 36.

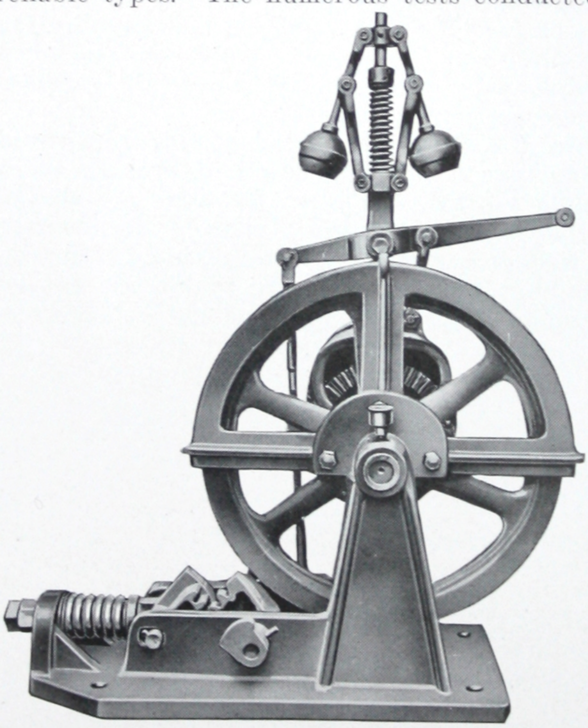


Plate 1153

Fly-Ball Type Speed Governor

Plate 1251 shows the steel car frame, or sling, with the wedge clamp type safety device mounted below the car and forming the bottom cross member of the frame.

A Fly-Ball Governor, such as shown by Plate 1153, is essentially a part of this safety. This governor, which is mounted at the top of the hoistway, is driven by a wire rope which runs from the car over the governor operating sheave, thence around a tension sheave in the elevator pit, and from there back to the starting point on the car, where the two ends are joined together, thus forming a loop, or belt. This rope is driven by the car, to which it is attached by means of a spring clamp, known as a "releasing carrier." Fastened to this endless rope is another rope which is wound around the operating drum of the safety device. When the elevator speed, for any reason, exceeds its normal speed by a predetermined value, the fly-ball governed cams, which are shown in the cut, grip the cable and stop it.

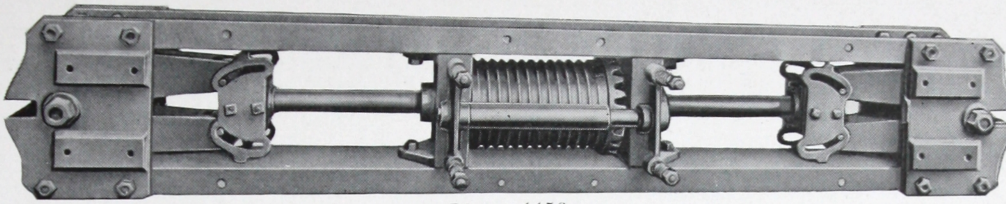


Plate 1156

Wedge-Clamp Type Guide Grip Safety Device

The continued movement of the car unwinds the rope from the drum on the safety device. As this drum rotates it operates the clamps which grip the guide rails and bring the car to a gradual but positive stop.

Plate 1251

Elevator Sling with Wedge Clamp Safety Device in Place

In accordance with the elevator safety orders of the Industrial Accident Commission of the State of California, every type of guide grip safety device and its subsequent modifications, if any, is drop tested in the presence of a representative of that body before its use is permitted. Furthermore, to insure the perfect functioning of these safety devices, they are tried out with full load, running full speed on every individual elevator installation.

Car Operating Switch: All car-operating switches automatically return to the off position and stop the car in case the operator's hand is accidently or inadvertently removed from it. Plate 1283, Page 31 shows the type of car switch used on gearless traction elevators. It is also provided with a centering latch so arranged that any accidental leaning against the switch handle will not move it to the running position.

Car Emergency Switch: This switch is for the purpose of stopping the car in the event the car-operating switch becomes inoperative, due to mechanical or electrical trouble in it or on the control panel. It opens the power supply circuit through the agency of a magnetic contractor, or potential switch, which is not ordinarily a part of the regular controller.

Terminal Slow-Down and Limit Switches: These act automatically each time the car approaches the terminal landings, and function to slow the car down and bring it to rest at these landings. Slow-down

switches are not necessary and are not used on very slow speed cars. For slow and moderate speed cars these switches are mounted in the hoistway and operated by a cam on the car, while for higher speeds a drum type switch is located on the car and the cam is placed in the hoistway. See Page 10. Winding drum machines are also equipped with a terminal stop switch which is driven from the drum.

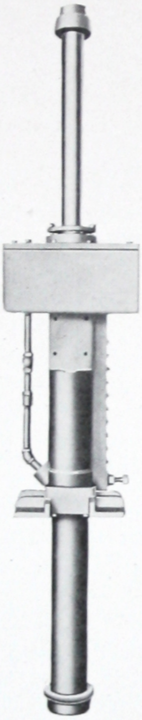


Plate 1301

Oil Type Buffer

Overtravel-Limit Switches: These are always mounted in the hoistway and operated by cams on the elevator car. They are located beyond the normal range of travel, and function to stop the car in case of the failure of the terminal stop limits.

Slack Cable Switch: Ordinarily, this is used on a winding drum type elevator to open the control switch in case of slack cable caused by the car or counter-weight being caught in the guides. It is operated automatically when the cables slacken.

Door Safety Switches. These in combination with door locks, make it impossible to operate the car unless all hoistway doors are closed and locked.

Compensating Cable Sheave Switch: When compensating cables are used, a switch is so arranged in the elevator pit that abnormal vertical movement of the tension sheave cuts off the power. This is to prevent the cables from becoming slack and getting caught in the tension device.

Buffers: In case anything should happen to the slow-down, stop, and over-travel switches to make them ineffective in stopping the car at the terminal landing, the buffer would be called upon to stop it. These buffers are placed in the elevator pit; one under the counter-weight and one under the car. On all except the very slow speed elevators, the Oil Cushion Buffer is used. The Llewellyn Oil Cushion Buffer has been carefully designed to give a uniform rate of retardation, which will stop the car smoothly under all conditions of load and speed. Plate 1301 shows the buffer, while Plate 1291, Page 10, shows their location in the elevator pit. It is simply a very strongly constructed oil dash pot so made that when the car strikes the plunger oil is forced from the cylinder proper through graduated openings into another chamber of the buffer. When the load is removed from the plunger it is raised back into place by a long coil spring.

HYDRO-ELECTRIC ELEVATORS

Hydro-Electric drive is particularly adaptable to freight elevators, serving two or three floors. It is the combination of Hydraulic and Electric drive in which a centrifugal pump driven by an electric motor supplies the power to lift the platform.

Elevators of this type, because of their simplicity, have a lower initial cost than any others obtainable. They require very little maintenance, the only water lost is due to evaporation from a Surge Tank, located near the pump and they are very quiet in operation. Because of the last named characteristic they may be installed in any type of building without fear of disturbing noise.

As no over-head supports are necessary for Hydro-Electric installations they find particular favor in buildings where a lift is desired for two or three of the lower floors without wishing to waste space on floors above not served by the elevator. Sidewalk elevators are also best served by this type of drive.

Hydro-Electric elevators can be designed for any desired capacity, but the speed should be limited to approximately fifty feet a minute. Rope control is standard for these lifts but they may be equipped for either car switch or push button control.

The motor and pump are direct-coupled, mounted on a single bedplate and are of the best design obtainable for this service. The motor is of the high torque, quick starting type which draws a minimum amount of current from the power line on starting. The quick starting characteristic is essential for inching the car when spotting it at a landing. It has grease packed ball bearings that require only infrequent lubrication.

The pump design is equal in quality to that of the motor and the materials and workmanship are combined to give a highly efficient two stage horizontally split case unit. The impellers and all wearing parts are of bronze in place of cast iron which forms similar parts in the average pump for this service. The impellers are of the inclosed type and the water enters them in a manner which produces practically no end thrust. Carefully aligned ball bearings packed in grease are supplied.

The complete pumping unit is efficient, neat in appearance, very quiet and occupies little floor space.

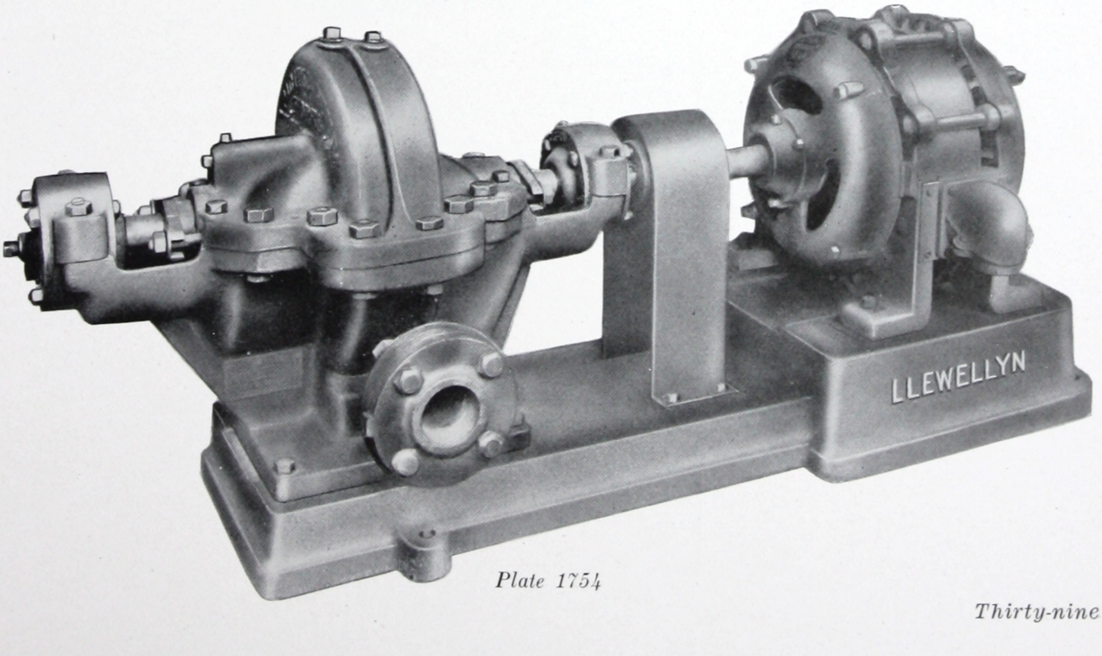


Plate 1754

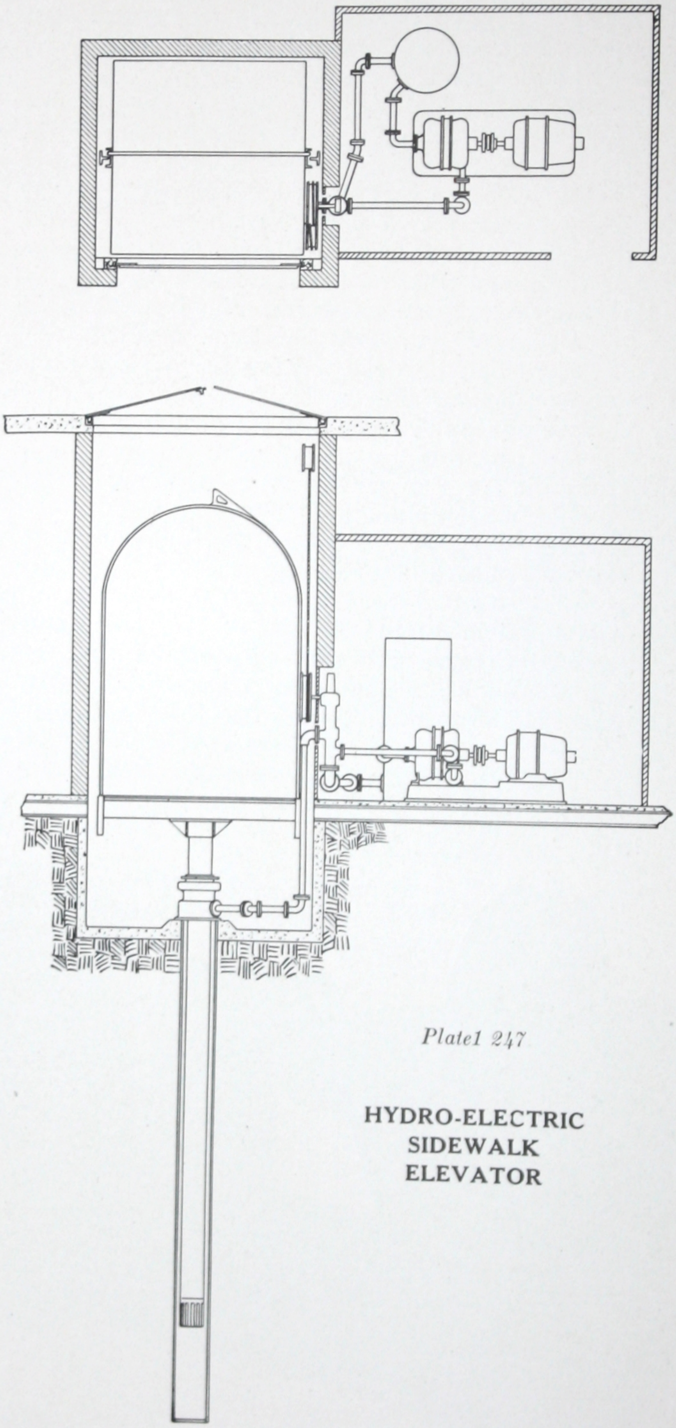


Plate1 247

HYDRO-ELECTRIC SIDEWALK ELEVATOR

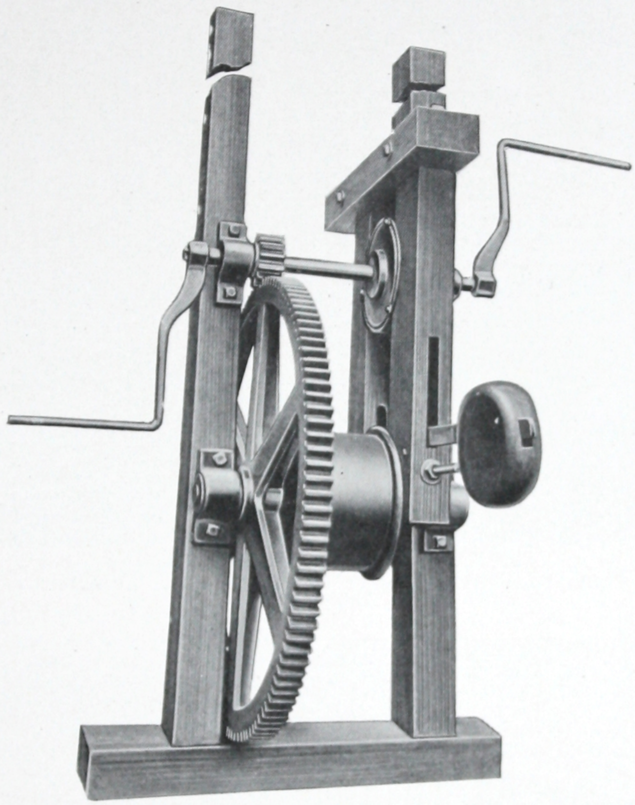


Plate 1158

HAND-POWER HOIST FOR SIDEWALK ELEVATOR

When a Side-walk Elevator is used infrequently for hoisting or lowering light loads the hand-power machine is useful and inexpensive.

Our standard machine illustrated above has a lifting capacity of about 1,500 pounds with two men at the cranks.

The crank-shaft is equipped with a brake to permit lowering the load by gravity.

ALEXANDRIA HOTEL, Los Angeles
Six Llewellyn Plunger Type Hydraulic Elevators

REX ARMS APARTMENTS, Los Angeles
One Car Switch Control Passenger Elevator and One Automatic Push Button Control Freight Elevator

BROADWAY DEPARTMENT STORE, Los Angeles

Sixteen Llewellyn Hydraulic Plunger Type Passenger Elevators
Three Automatic Electric Dumb-waiters
Six gearless variable voltage passenger elevators—3,000 lbs. at 400 f. p. m.
Two gearless variable voltage freight elevators—10,000 lbs. at 200 f. p. m.

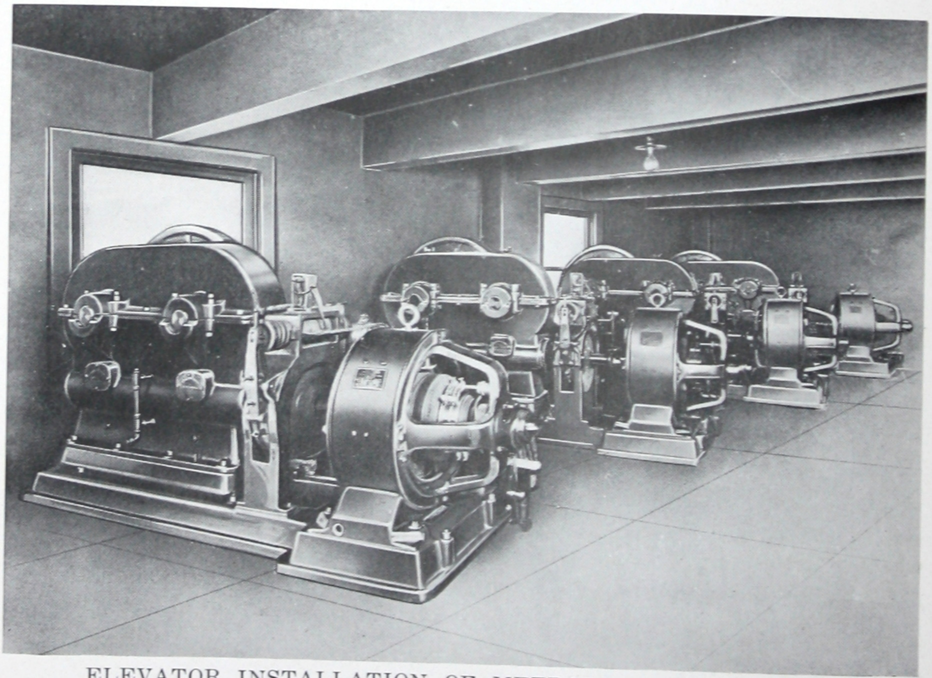
BULLOCK'S
DEPARTMENT STORE

Nine Llewellyn Vertical Cylinder Hydraulic Passenger Elevators

Nine gearless variable voltage passenger elevators—3,500 lbs. at 500 f. p. m.

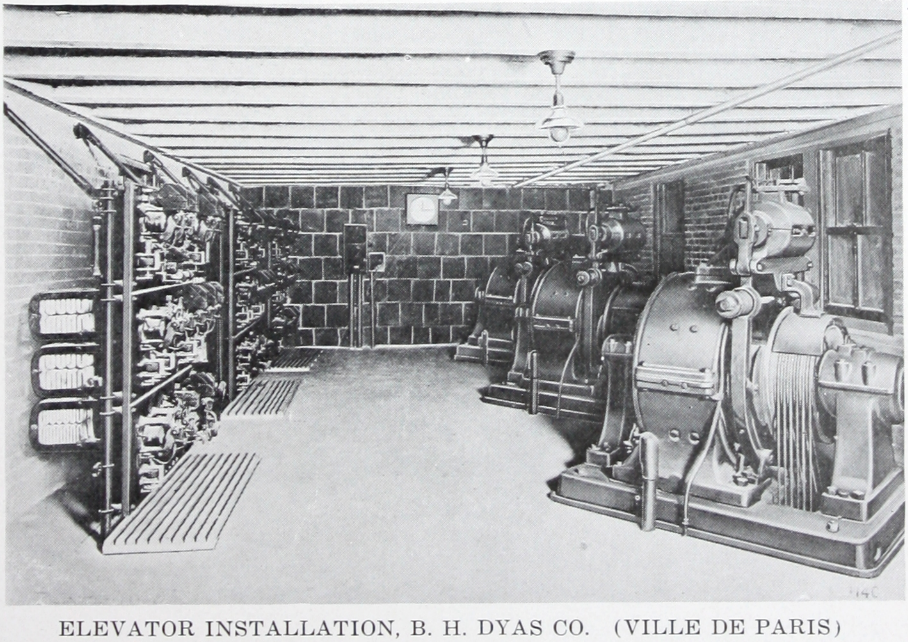
Two geared variable voltage freight elevators—6,000 lbs. at 250 f. p. m.

METROPOLITAN BUILDING
Los Angeles



ELEVATOR INSTALLATION OF METROPOLITAN BUILDING
Four Llewellyn Tandem, Worm-gear, traction drive, Elevators; Capacity 3,500 lbs. at 400 ft. per minute

B. H. DYAS BUILDING, VILLE DE PARIS
Seventh and Olive Streets, Los Angeles, California



ELEVATOR INSTALLATION, B. H. DYAS CO. (VILLE DE PARIS)
Four Llewellyn Gearless Traction Passenger Elevators

NEW YORK 170 FIFTH AVENUE
PARIS 18 BOULEVARD DE STRASBOURG

CABLE ADDRESS, BERNAL,LOS ANGELES
LIEBERS CODE

B. H. DYAS
PRESIDENT

VILLE DE PARIS
A FUSENOT COMPANY
B.H. DYAS CO.
OPERATED BY
B.H. DYAS CORPORATION
LOS ANGELES

Sept. 20, 1921

Llewellyn Iron Works,
Los Angeles, Calif.

ATTENTION MR. BARUCH CHIEF ENGINEER.

Gentlemen:

Replying to your favor of September 16th, regarding views of our building, we are mailing to you under separate cover two photos one of the building, the other of the elevators installed.

It is a pleasure to give you these photos, where the best elevators in town are installed, and if we can be of any further service to you, kindly let us know.

Yours very truly,

VILLE DE PARIS B.H. DYAS CO.

RCP:GB

GENERAL MGR. R C Paulsen.

AMBASSADOR HOTEL, Los Angeles
Equipped with Llewellyn Elevators

Two No. 105 Basement Type, Single-Wrap Service Elevators
Two No. 102 Freight Elevators

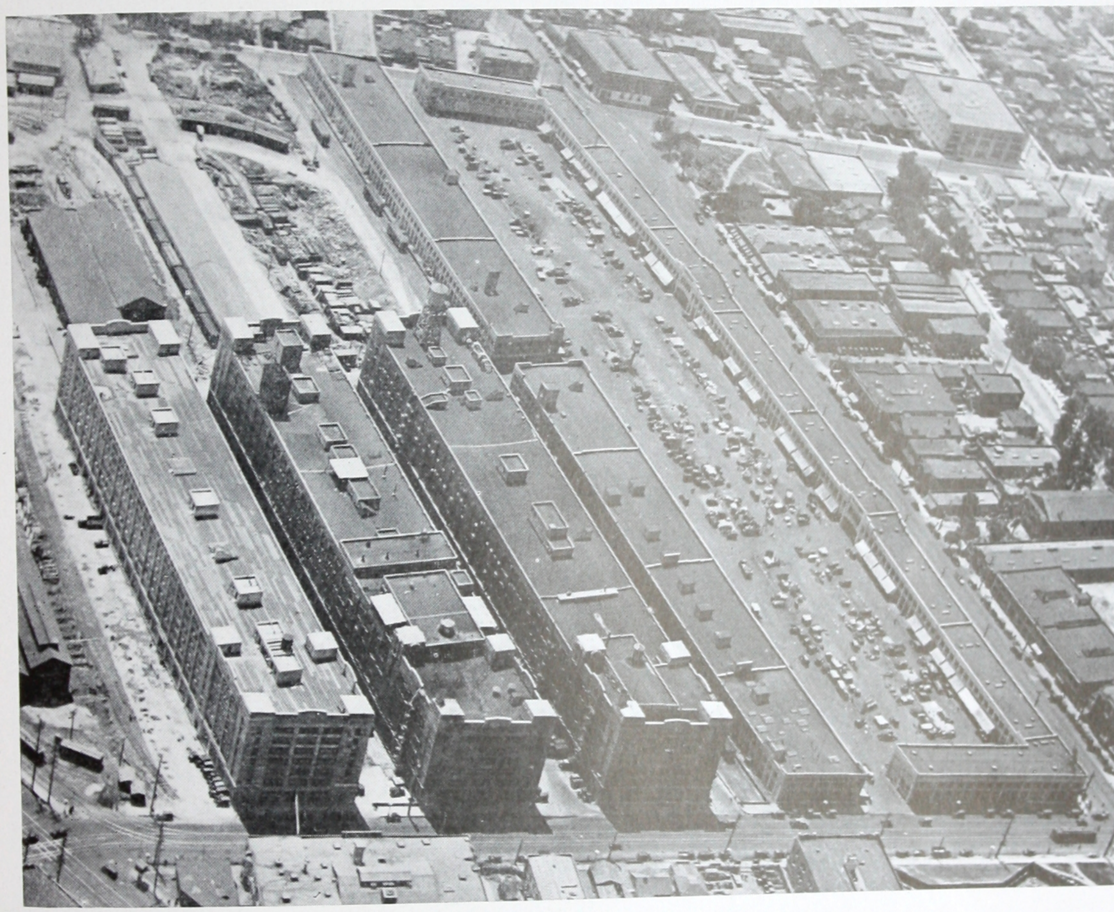
Three No. 105 Basement Type, Passenger Elevators
One Electric Dumb Waiter

F. B. SILVERWOOD, Los Angeles
Two Llewellyn Single Worm Gear, Single Wrap Traction Elevators
One Worm Gear Drum Type Freight Elevator

LOS ANGELES RAILWAY BUILDING
Los Angeles

Three Llewellyn Gearless Passenger Elevators

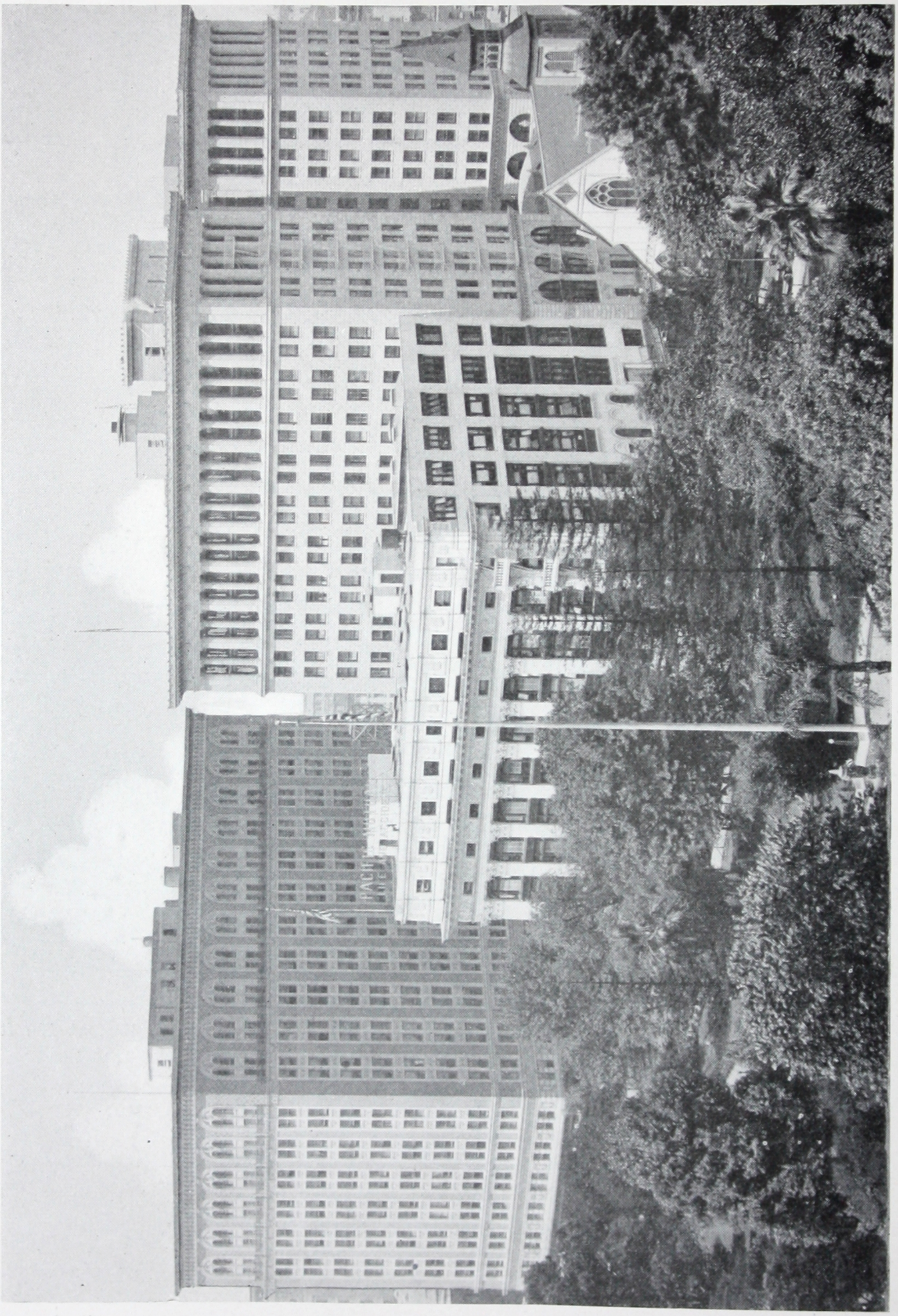
Capacity 3,000 pounds at 600 feet per minute



AIRPLANE VIEW LOS ANGELES UNION TERMINAL

Fourteen Llewellyn Elevators—Ten Freight Elevators with a capacity of 4000 lbs., at 100 ft. per minute and Three with a capacity of 8000 lbs., at 50 ft. per minute. Also One Passenger Elevator, Capacity 2500 lbs., at 125 ft. per minute.

MADE IN U.S.A.
LLEWELLYN
LOS ANGELES, CAL



PACIFIC FINANCE BUILDING — PACIFIC MUTUAL LIFE INSURANCE BUILDING — PACIFIC MUTUAL BUILDING

PERSHING SQUARE IN FOREGROUND

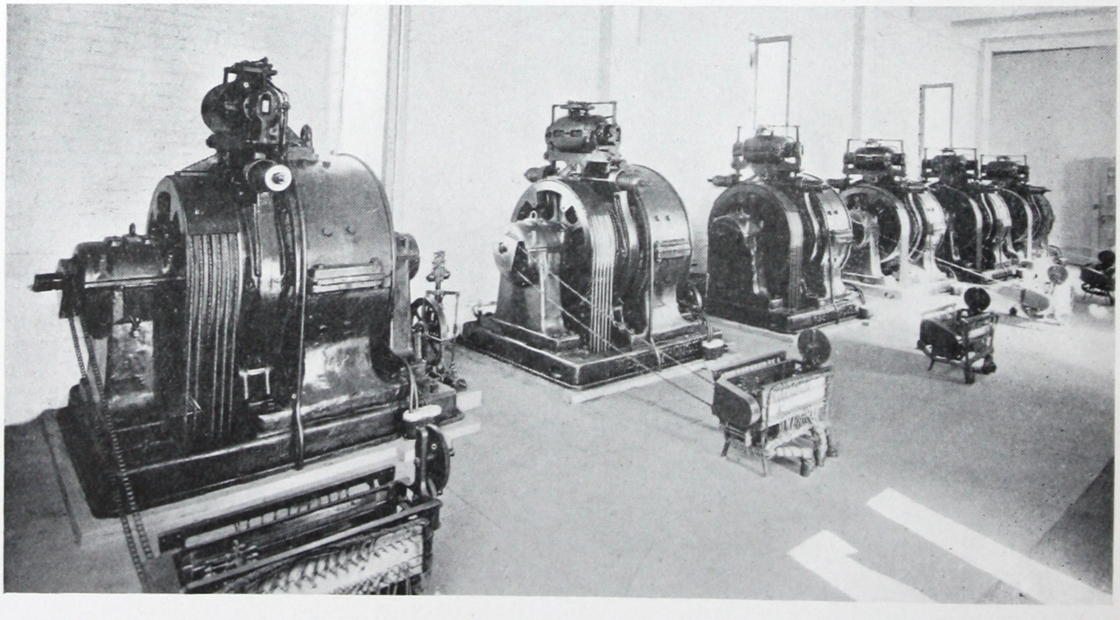
All of the Buildings in the Above Picture are Equipped with Llewellyn Elevators
Steel Work Was Fabricated and Erected by Llewellyn Iron Works

PACIFIC FINANCE BUILDING
Four Llewellyn Gearless Passenger Elevators,
Capacity 3000 lbs. at 600 ft, per minute.
One Sidewalk Elevator

PACIFIC MUTUAL LIFE INSURANCE COMPANY'S BUILDING
Two Llewellyn Drum Type Single Worm Gear Passenger Elevators.

Elevator Entrance
Pacific Finance Building

PACIFIC MUTUAL BUILDING, Los Angeles, California



ELEVATOR INSTALLATION OF PACIFIC MUTUAL BUILDING
Eight Llewellyn Gearless Passenger Elevators, 3,000 lbs. capacity at 600 feet per minute

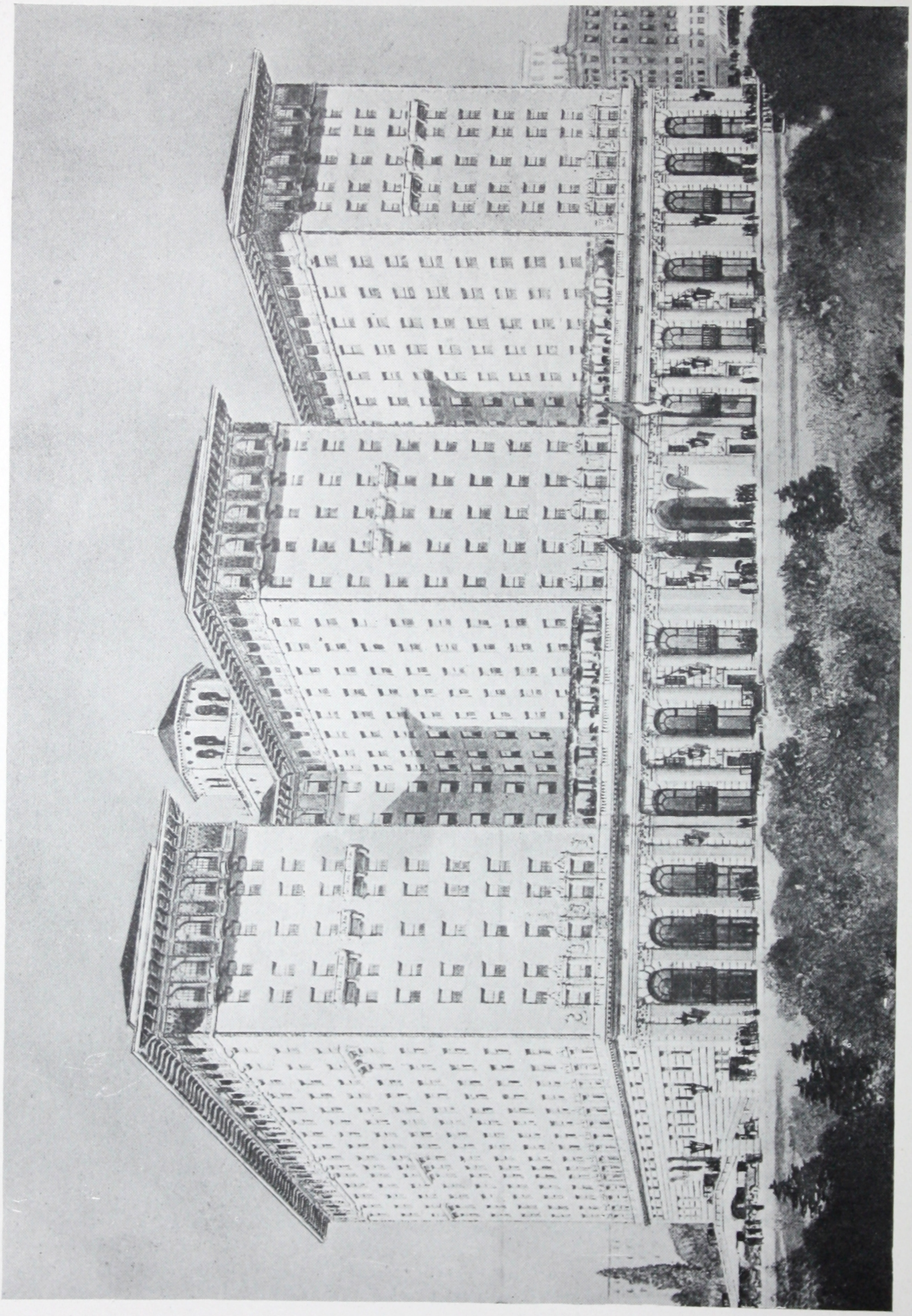
ELEVATOR ENTRANCE UPPER FLOORS PACIFIC MUTUAL BUILDING

ELEVATOR ENTRANCE GROUND FLOOR PACIFIC MUTUAL BUILDING

SUN DRUG CO. BUILDING, Los Angeles
Structural Steel fabricated and erected, and two Gearless Traction Passenger Elevators built and installed by Llewellyn Iron Works

BANK OF ITALY BUILDING MORGAN, WALLS & MORGAN, ARCHITECTS

Structural Steel Fabricated and Erected; Four Gearless Traction Passenger Elevators, One Worm Geared Freight Elevator and Two Hydro-Electric Elevators, built and installed by Llewellyn Iron Works



BILTMORE HOTEL, Los Angeles—1,000 ROOMS
Structural Steel Fabricated and Erected; six Gearless Traction Passenger Elevators, six Worm Gear Service Elevators and three Freight Elevators, built and installed by Llewellyn Iron Works